Procedure Manual for Safe Drinking Water in First Nations Communities South of 60°

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maintain and improve their health.

Health Canada

Published by authority of the
Minister of Health
First Nations and Inuit Health Branch
Environmental Health Division

Également disponible en français sous le titre
Manuel de procédures en matière de salubrité de l'eau potable dans les collectivités des Premières nations au sud du 60e parallèle

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Revised 2007

Cat. H34-140/2007E
ISBN 978-0-662-42067-5

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Acknowledgements

The Environmental Health Division (EHD) of the Primary Health Care and Public Health (PHCPH) Directorate of the First Nations and Inuit Health Branch (FNIHB) of Health Canada would like to acknowledge and thank all of the FNIHB Regional Environmental Health managers and their staff, representatives of FNIHB's Communicable Disease Control Division (CDCD), Office of Nursing Services (ONS) and Office of Community Medicine (OCM), Healthy Environments and Consumer Safety (HECS) Branch representatives, Indian and Northern Affairs Canada (INAC) representatives, and the Assembly of First Nations (AFN) representatives who reviewed and contributed to the development of the *Procedure Manual For Safe Drinking Water in First Nations Communities South of 60°* over the past year. This manual would not have been completed without their generous support and technical advice.

Regional environmental health officers (EHOs) and First Nations communities that carry out community-based drinking water safety programs south of 60° will now have a common reference and a consistent set of national procedures for monitoring drinking water quality on reserve and contribute to ensuring the safety of the drinking water system in communities.

Introduction

South of 60°, the management of water supplies from source to tap, in First Nations communities is shared between First Nations and the federal government. Health Canada works in partnership with First Nations communities south of 60° to ensure that drinking water quality monitoring programs are in place on their lands. Indian and Northern Affairs Canada (INAC) funds water services infrastructure such as construction, upgrades, operation, and maintenance of water treatment facilities on First Nations reserves. INAC also funds the training of water facilities operators. First Nations are responsible for the daily management and operation of water and wastewater services.

The *Procedure Manual for Safe Drinking Water in First Nations Communities South of 60°* describes Health Canada's recommended approach, detailing best-management practices for monitoring drinking water quality in First Nations communities. This manual is designed to be used by environmental health officers monitoring the quality of drinking water in First Nations communities south of 60°.

This manual incorporates text and policies from the publications: *Guidelines for Canadian Drinking Water Quality* (GCDWQ) and *From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water*. Health Canada collaborates with the provinces and territories through the Federal-Provincial-Territorial Committee on Drinking Water to establish the *GCDWQ*. *From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water* was written as a collaborative effort of a working group of this committee (reporting to the Federal-Provincial-Territorial Committee on Health and Environment) and a working group of the Canadian Council of Ministers of the Environment's Water Quality Task Group.

This manual will be updated and reviewed as needed to reflect changes to the GCDWQ, Health Canada's policies, and water science technology.

1 From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water

This chapter incorporates text from
From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water
which was prepared by the
Federal–Provincial–Territorial Committee on Drinking Water of the
Federal–Provincial–Territorial Committee on Environmental and Occupational Health
and the Water Quality Task Group of the Canadian Council of Ministers of the Environment

May 16, 2002

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1.1 Preface

This short position paper From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water outlines the elements of a multi-barrier approach which would help ensure that Canadian drinking water supplies are kept clean, safe and reliable for generations to come. The multi-barrier approach recognizes the inter-relationship of health and environmental issues, and encourages the integration of efforts to improve public health with those that also protect the natural environment.

This paper was prepared for a general audience (i.e., government, citizens, and interested stakeholders) to communicate the concept of a multi-barrier approach to drinking water protection. It builds on the experiences of Canadian jurisdictions and serves as a template for the strategic alignment of *Guidelines for Canadian Drinking Water Quality*, best management practices, research and monitoring with an integrated source to tap approach to drinking water protection.

This document provides the basis for the on-going integration of health and environmental issues related to drinking water quality and should set the stage for increased collaboration and information-sharing among jurisdictions.

1.2 Acknowledgements – From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water

This paper was written as a collaborative effort between a working group of the Federal-Provincial-Territorial Committee on Drinking Water (which reports to the Federal-Provincial-Territorial Committee on Environmental and Occupational Health) and a working group of the Canadian Council of Ministers of the Environment's Water Quality Task Group. Together, these groups represent the ministries of health and/or environment in every province and territory, as well as the departments of health and environment at the federal level.

For more information on water issues, please visit the following websites:

- Health Canada's water quality program: **www.hc-sc.gc.ca/waterquality**
- The Canadian Council of Ministers of the Environment: **www.ccme.ca**

The working groups would like to thank Roberta Smith of Blue Lantern Communications for her invaluable assistance in preparing this document.

1.3 Introduction – From Source to Tap: The Multi-Barrier Approach to Safe Drinking Water

Recent outbreaks of waterborne disease in Walkerton, Ontario, and North Battleford, Saskatchewan, have heightened Canadians' awareness that threats to water quality and quantity can have a profound impact on their health, the environment, and the economy.

In recognition of the above, it is imperative that drinking water be kept clean, safe and reliable. In order to do so, the components of the water supply system—from source protection to the treatment and distribution of drinking water to consumers—must be understood and managed as a whole.

Even though no approach will guarantee 100 per cent protection all of the time, it has been demonstrated that the most effective way to manage drinking water systems is to implement a multi- barrier approach (see sidebar). The goal of this approach is to reduce the risk of contamination of the drinking water, and to increase the feasibility and effectiveness of remedial control or preventive options. As a safeguard, it is important for contingency plans to be in place to respond to incidents as they arise, and for redundancies to be built into the system wherever feasible.

The multi-barrier approach is…

… an integrated system of procedures, processes and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health.

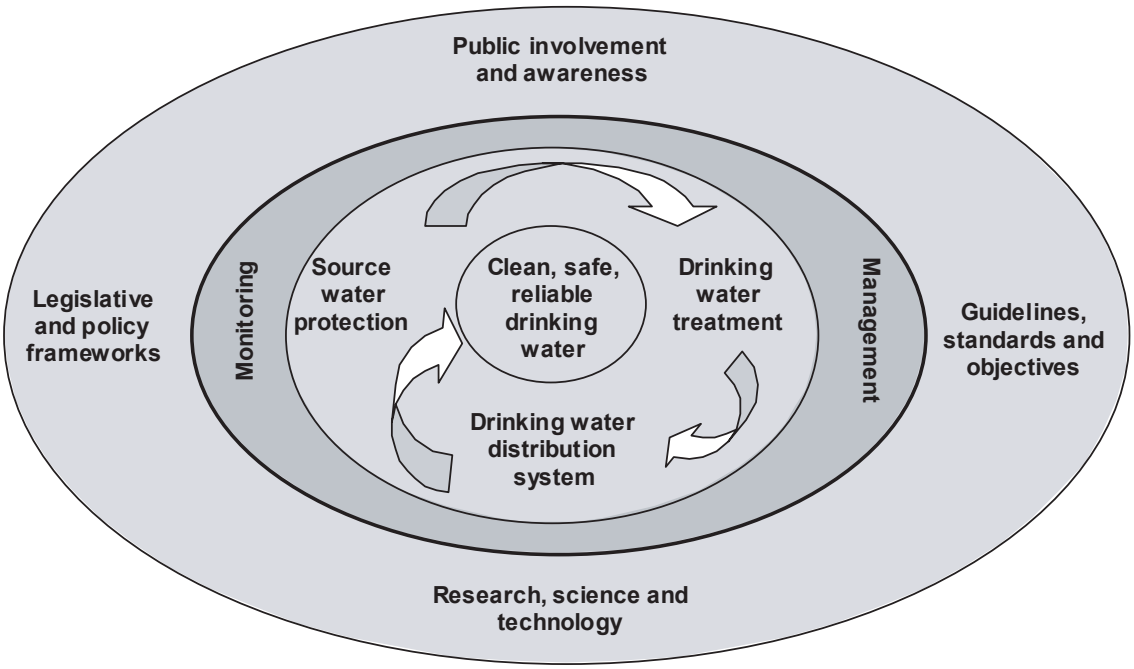
Figure 1 (page 1.3.2) depicts a multi-barrier approach to safe drinking water that contains three major elements. These elements are source water protection, drinking water treatment, and the drinking water distribution system. These elements are addressed in an integrated manner by using a system of procedures and tools, such as:

- Water quality monitoring and management of water supplies from source to tap;
- Legislative and policy frameworks;
- Public involvement and awareness;
- Guidelines, standards and objectives;
- Research;
- The development of science and technology solutions.

Under the multi-barrier approach, all potential control barriers are identified along with their limitations. Limitations could include risks of pathogens or contaminants passing through the barrier. Individually, the barriers may be inadequate in removing or preventing contamination of drinking water, but together they offer greater assurance that the water will be fit to drink. This approach also helps ensure the long-term sustainability of water supply systems.

This document briefly discusses each element of the approach as a separate section, starting with the components in the outer ring of Figure 1 and moving towards the centre.

Figure 1: The Multi-Barrier Approach



1.4 Legislative and Policy Frameworks

Overarching legislative and policy frameworks outline who is responsible for each aspect of the drinking water system and their specific responsibilities. These frameworks should be reviewed and revised as necessary. It is important that policies at all levels related to the quality of drinking water support public health goals.

In Canada, all levels of government have some responsibility for drinking water, whether direct or indirect. Because drinking water is considered a natural resource, the legislative responsibility for providing safe drinking water to the public generally falls under provincial or territorial jurisdiction. Each province and territory has adopted legislation to protect its source waters and to establish requirements to provide clean, safe and reliable drinking water to its citizens. The federal government is responsible for drinking water under federal jurisdiction, such as on-board common carriers (e.g., ships, airplanes), in First Nations communities (shared responsibility), in military and other federal facilities, and in national parks.

All levels of government have policies and agreements in place which affect the quality of drinking water, ranging from land-use agreements in watersheds; to water quality monitoring, inspections, and operator certification; to purchasing policies for materials that come into contact with drinking water throughout the treatment and distribution chain. The federal government plays a leadership role in developing guidelines and conducting research into health based issues in collaboration with its partners in other jurisdictions.

Because of the complexity of water quality issues, and because public health is at stake, it is critical for all members of a drinking water program—whether elected officials (including municipal), regulators, scientific staff, utility operators, or others—to have appropriate levels of knowledge and understanding of the impact of their activities and decisions on the quality of the water. To this end, access to continuing education in this field is important.

It is imperative that all stakeholders — including government departments, industry, private sector companies, non-governmental organizations, and the public — work cooperatively without losing sight of the ultimate goal: the protection of public health.

1.5 Public Involvement and Awareness

As previously mentioned it is essential to maintain appropriate levels of partnership and communication among stakeholders. In addition, the public has expectations of government transparency and the availability of public health information. It is important that the public be aware that they can report concerns to the appropriate authority.

Drinking water programs can involve the public and increase awareness of drinking water quality issues by:

- Informing the public about the program impact on source water quality and about available pollution mitigation measures;
- Informing the public about health risks and providing educational materials on issues such as water disinfection, guidelines, conservation issues, and costs of providing service;
- Making monitoring results or summaries available and relaying information about what the authority is doing to address the risks;
- Issuing regular reports about drinking water systems, including improvements and areas that need further attention;
- Incorporating public consultations into decision-making processes that have an effect on public health, such as the development of new guidelines and regulations.

Providing additional information to owners of private drinking water systems (groundwater or surface water) is very important as they are responsible for regularly testing the quality of their water. Owners need to know what to do in case of microbiological or chemical contamination of their drinking water. Well-owners need to know how to maintain their wells and how to arrange to decommission wells that are no longer safe or needed.

All landowners should be encouraged through community awareness programs to implement best management practices such as protecting stream banks, providing buffer strips, and subsidizing tree planting and fencing works.

1.6 Guidelines, Standards, and Objectives

Guidelines, standards and objectives provide utility managers and system owners with drinking water quality targets to strive to achieve within their systems. These targets are closely linked to monitoring results, as the latter tell utility managers and system owners how close they are to meeting targets and help them make decisions about their water system. In some jurisdictions, meeting these targets is mandatory.

Because raw water (including ground and surface waters) may support a variety of beneficial uses, such as aquatic life and agriculture, a number of guidelines[1] have been developed to protect these uses; these guidelines may help protect or enhance the quality of water used as a source for drinking water even though they are not specifically developed for this reason.

Since it is prudent to protect raw water supplies to ensure they are maintained as good sources of drinking water, these guidelines, and those developed for source waters, may be used as benchmarks to develop protection measures or corrective actions in watersheds and around wells, and to measure the success of management practices. Watershed management encompasses both regulatory and nonregulatory strategies. The success of watershed management is based on agreed-upon, achievable, environmental quality objectives.

The development and implementation of source water quality guidelines not already in place would add a new dimension to source protection efforts and would complement the multi-barrier approach.

For drinking water, the *Guidelines for Canadian Drinking Water Quality*[2] set out the basic parameters all water systems should strive for in order to deliver the cleanest, safest, and most reliable drinking water to consumers. These guidelines apply to water destined for human consumption and are developed for select physical, chemical, microbiological, and radiological parameters. The most important guidelines deal with microbiological quality and help ensure that the risk of exposure to disease-causing organisms in drinking water is minimized.

[1] The guideline values for other beneficial uses are posted on the website of the Canadian Council of Ministers of Environment at **www.ccme.ca**.

[2] All values and supporting documentation for the *Guidelines for Canadian Drinking Water Quality* are posted on Health Canada's water quality website at **www.hc-sc.gc.ca/waterquality**.

1.7 Research and Science and Technology

Research, disease surveillance, and associated science and technology development serve core functions in the multi-barrier approach. Like other elements, all levels of government—in collaboration with universities, institutes, the water industry and other research networks—should be involved in this function. For example, there is a growing need to better integrate existing and future water quality monitoring (source and drinking) with waterborne disease surveillance. This integration is requisite to a full understanding of the relationship between source water quality, drinking water quality, and the ultimate health outcomes and benefits of a multi-barrier approach.

1.8 Management

The successful management of the drinking water supply from source to tap requires the commitment and co-operation of a wide array of stakeholders representing a variety of fields (e.g., health, environment, agriculture, industry, waste management). It also requires qualified personnel to run the various aspects of the system.

Standard operating procedures should be followed to ensure treatment and distribution systems are operating at optimum levels. Operator certification programs are one example, as these provide treatment plant and distribution system operators with appropriate levels of education, experience, and knowledge to allow them to competently operate the type of plant or system in which they are working.

That said, regardless of how well operated a drinking water system may be, unexpected incidents may occur. Contingency procedures are important as they are an effective means to cover off any number of incidents such as the loss of source water, major main breaks, vandalism, treatment plant failure, and deliberate chemical or microbiological contamination of the distribution system or reservoirs. Also important are management plans dealing with potential sources of contamination within the watershed area that may affect drinking water quality and emergency plans which include clear procedures for communicating with appropriate authorities and the public and for remediating the situation.

1.9 Monitoring

Water quality monitoring takes place throughout the system for a number of reasons. Use of accredited laboratories better ensures sampling test results are accurate.

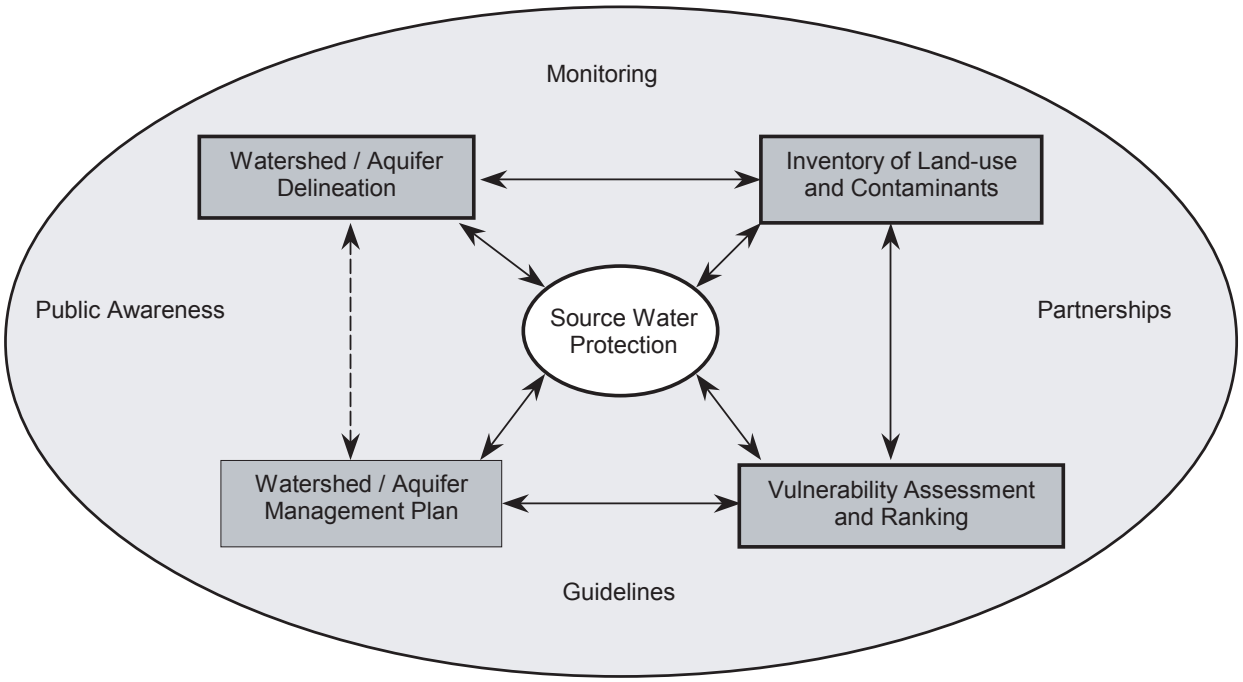
Source water monitoring provides useful information on the water supply when selecting a source for drinking water. Data collected also influences the design of the treatment solution as it helps determine what type of treatment is needed. Once treatment is in place, on-going monitoring at the intake allows plant operators to modify treatment if water quality fluctuates. Monitoring in other parts of the treatment plant ensures treatment is working properly and that water leaving the plant is safe for human consumption. Compliance monitoring in the distribution system ensures any problems that arise can be dealt with as quickly and efficiently as possible, thus ensuring that water reaching consumers is clean, safe and reliable.

1.10 Source Water Protection and Management

In any drinking water system, protecting source water is a critical step towards avoiding drinking water contamination. Source water protection (see Figure 2) based on watershed management involves a coordinated approach among stakeholders to develop short- and long-term plans to prevent, minimize, or control potential sources of pollution or enhance water quality where necessary. Source water includes surface waters, aquifers or groundwater recharge areas.

In addition to reducing public health risks, effective watershed management minimizes operating costs and reduces the degree of drinking water treatment required, the quantity of chemicals used during treatment, and the creation of treatment by- products.

Figure 2: Components of Source Water Protection



1.11 Drinking Water Treatment

Water treatment is key to both the multi-barrier approach and to protecting public health. The safety of Canada's drinking water is largely due to the introduction of disinfection at the start of the 20th century which eradicated serious and life-threatening diseases such as cholera and typhoid fever. That said, the safety of Canada's drinking water supplies is still challenged by microbiological pathogens and chemical substances found in source waters.

In order to safeguard public health, it is important that treatment systems be designed and constructed based on the results of source water assessments. They should be regularly reviewed and upgraded as necessary. Items to consider in designing effective treatment systems include the treatment processes required, treatment components (including redundancies), equipment design, chemicals used, treatment efficiency, and monitoring procedures. In assessing these components, potential hazards and their causes should be identified along with their associated health risks so priorities for risk management can be established.

Comprehensive, scientifically defensible, and achievable performance standards—based on recognized principles—are essential to ensuring the effectiveness and reliability of treatment technologies. Decision-makers must balance the need or desire to use the latest technologies against economic realities. Public health goals should be at the forefront of any treatment-related decision.

Criteria for the design and operation of the treatment system should be established to ensure public health protection objectives are met. Alternative approaches may be used if these have been demonstrated to be equivalent or better ways of achieving the same objectives.

Only certified products (such as chemicals, plumbing materials or water treatment devices) that meet recognized health-based performance standards should be used during treatment and distribution. For consumers who use treatment devices in their homes, the proper selection, operation and maintenance of off-the-shelf products is important to reducing the risk of illness.

1.12 Drinking Water Distribution Systems

The distribution system is the final physical barrier in the multi-barrier approach. After treated drinking water leaves the treatment plant, its quality must be maintained throughout the distribution system. Diligence is required on the part of the system operator to ensure sufficient disinfectant is present at all points throughout the distribution system in order to adequately protect public health. Because it has been shown that a significant number of outbreaks are caused by breakdowns in the distribution system, authorities are encouraged to put active cross-connection control programs in place.

Treated water reservoirs and distribution systems should be designed, constructed, reviewed and upgraded as necessary, to take the following into account: all local or provincial bylaws, best management practices, and regulations; prevention of access by wildlife and unauthorized personnel; system capacity; emergency water storage; contact time required for disinfection; minimization or elimination of dead ends, and cross-connection controls.

1.13 Future Directions

The provision of drinking water is made up of multiple stages or processes. A multi-barrier approach to the protection, production and distribution of drinking water takes local conditions and challenges into account while offering an integrated system of procedures, processes and tools to reduce the risk of, or prevent, contamination. To be effective, its implementation requires the commitment and co-operation of a wide range of stakeholders—from elected officials and government employees, to members of the water industry and the public.

The successful use of similar approaches elsewhere in the world validates the endorsement of a national multi-barrier approach. In fact, in some international and provincial jurisdictions, similar approaches have already been incorporated into legislation to protect water supplies from source to tap.

A comprehensive supporting document, to be developed by the Federal-Provincial-Territorial Committee on Drinking Water, over the coming months, will provide more details about the multi-barrier approach and offer guidance to Canadian authorities on how it could be implemented in Canadian communities.

2 Legislation, Regulations and *Guidelines for Canadian Drinking Water Quality*

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2.1 Legislation, Regulations and Guidelines

Legislation and regulations concerning water can be examined in three areas: watershed/source management, drinking water and wastewater. This multi-barrier approach to managing water reduces the risk of contamination at each stage of the drinking water system.

The multi-barrier approach to protecting drinking water looks at all components of a drinking water system and identifies the safeguards needed to provide safe drinking water. The components include source water protection, drinking water treatment, and distribution systems. The safeguards include management, monitoring, research, science and technology development, guidelines, standards and objectives, legislative and policy frameworks, and public involvement and awareness. The elements of a successful drinking water program can include state-of-the art facilities operation certification, an effective compliance assurance program with emergency response procedures, and measures to ensure public safety.

The role of Health Canada's First Nations and Inuit Health Branch (FNIHB) in the multi-barrier approach for safe drinking water in First Nations communities is ensuring drinking water quality monitoring in those communities.

Watershed/Source Management

Environment Canada is actively involved in preventing water pollution and restoring water quality and ecosystem health. This work is carried out under the Canadian Environmental Protection Act 1999 (CEPA 1999). CEPA focuses on pollution prevention, including water pollution. The Fisheries Act addresses the protection of fish and fish habitat. Environment Canada continues to work with provinces to protect and restore aquatic ecosystems. For more information, please refer to Environment Canada's Freshwater website at **www.ec.gc.ca/water**.

Drinking Water Supplies

Indian and Northern Affairs Canada (INAC) services to First Nations communities include, but are not limited to, water and wastewater facilities.

New water systems or upgrades to existing facilities should be capable of providing drinking water, at tap, that meets Health Canada's Guidelines for Canadian Drinking Water Quality (latest edition), relevant sections of the National Building Code standards, and provincial/territorial guidelines and regulations where these are more stringent. For more information, please refer to Indian and Northern Affairs Canada's website at **http://www.ainc-inac.gc.ca/H2O/sdw/index_e.html**.

2.2 Drinking Water Quality Monitoring

The latest edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) set out the basic parameters all drinking water systems should strive to achieve in order to deliver clean, safe and reliable drinking water at tap. These guidelines apply to water destined for human consumption and are developed for select physical, chemical, microbiological, and radiological parameters. The most important guidelines deal with microbiological quality and help ensure that the risk of exposure to disease-causing organisms in drinking water is minimized.

Aesthetic guidelines address those parameters or characteristics that affect the consumer's acceptance of the water — such as taste, odour and colour — or which can interfere with practices for supplying good water. Aesthetic values are far below levels which result in health effects.

For more information, please refer to Health Canada's website at **www.hc-sc.gc.ca/water quality**. To be automatically notified of updates to the Summary of the *Guidelines for Canadian Drinking Water Quality*, please join the mailing list referred to on this website.

2.3 *Guidelines for Canadian Drinking Water Quality* Summary Table

Prepared by the
Federal–Provincial–Territorial Committee on Drinking Water of the
Federal–Provincial–Territorial Committee on Health and the Environment

March 2006

NOTE: This Summary Table has been updated to December 2006 to reflect recent changes to the *Guidelines for Canadian Drinking Water Quality*

The *Guidelines for Canadian Drinking Water Quality* are published by Health Canada on behalf of the Federal-Provincial-Territorial Committee on Drinking Water (CDW). This summary table is updated regularly and published on Health Canada's web site at **www.healthcanada.gc.ca/waterquality**. The web version supersedes all previous versions, as well as the published booklet of the *Sixth Edition of the Guidelines for Canadian Drinking Water Quality*.

These guidelines are based on current, published scientific research related to health effects, aesthetic effects, and operational considerations. Health-based guidelines are established on the basis of comprehensive review of the known health effects associated with each contaminant, on exposure levels and on the availability of treatment and analytical technologies. Aesthetic effects (e.g., taste, odour) are taken into account when these play a role in determining whether consumers will consider the water drinkable. Operational considerations are factored in when the presence of a substance may interfere with or impair a treatment process or technology (e.g., turbidity interfering with chlorination or UV disinfection) or adversely affect drinking water infrastructure (e.g., corrosion of pipes).

In general, the highest priority guidelines are those dealing with microbiological contaminants, such as bacteria, protozoa and viruses. Any measure taken to reduce concentrations of chemical contaminants should not compromise the effectiveness of disinfection.

Inquiries can be directed to: **water_eau@hc-sc.gc.ca**.

Membership of the Federal–Provincial–Territorial Committee on Drinking Water

For Jurisdictional representatives

Refer to HC's website at : **http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/member-membre_e.html**.

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New, Revised, Reaffirmed and Proposed Guidelines

Guidelines for several chemical, physical and microbiological parameters are new or have been revised since the publication of the *Sixth Edition of the Guidelines for Canadian Drinking Water Quality* in 1996. These new and revised guidelines are presented in Table 1.

Table 1. New and Revised Guidelines

Parameter	Guideline (mg/L)	Previous guideline (mg/L)	CHE approval
Microbiological parameters[a]			
Bacteriological		0 coliforms/100 mL	
E.coli	0 per 100 mL		2006
Total coliforms	0 per 100 mL		2006
Heterotrophic plate count	No numerical guideline required		2006
Emerging pathogens	No numerical guideline required		2006
Protozoa	No numerical guideline required	None	2004
Enteric viruses	No numerical guideline required	None	2004
Turbidity	0.3/1.0/0.1 NTU[b]	1.0 NTU	2004
Chemical and physical parameters			
Aluminum	0.1/0.2[c]	None	1999
Antimony	0.006	None	1997
Arsenic	0.01	0.025	2006
Bromate	0.1	None	1999
Bromodichloromethane (BDCM)	0.016	None	2006
Cyanobacterial toxins—microcystin-LR	0.0015	None	2002
Fluoride	1.5	1.5	1996
Formaldehyde	No numerical guideline required	None	2003
Methyl *tertiary*-butyl ether (MTBE)	0.015 AO	None	2006
Trichloroethylene (TCE)	0.005	0.05	2005
Trihalomethanes (THMs)	0.1	0.1	2006
Uranium	0.02	0.1	2001

[a] Refer to section on Guidelines for microbiological parameters.

[b] Based on conventional treatment/slow sand or diatomaceous earth filtration/membrane filtration.

[c] This is an operational guidance value designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance value of 0.1mg/L applies to conventional treatment plants and 0.2mg/L applies to other types of treatment systems.

The Federal-Provincial-Territorial Committee on Drinking Water has established a science-based process to systematically review older guidelines to assess the need to update them. Table 2 provides the list of parameters whose guidelines remain appropriate and have been reaffirmed as a result of this review. Health Canada and the FPT Committee on Drinking Water will continue to monitor research on these parameters and recommend any revision(s) to the guidelines that is deemed necessary.

Table 2. Reaffirmed guidelines (2005)

Asbestos	Colour	Glyphosate	Silver
Azinphos-methyl	Cyanazine	Iron	Taste
Bendiocarb	Diazinon	Magnesium	Temperature
Benzo(a)pyrene	Dicamba	Malathion	Terbufos
Bromoxynil	2,4-Dichlorophenol	Methoxychlor	2,3,4,6-Tetrachlorophenol
Cadmium	Diclofop-methyl	Metribuzin	Toluene
Calcium	Dimethoate	Odour	Trifluralin
Carbaryl	Diquat	Paraquat	Xylenes
Carbofuran	Diuron	Phorate	Zinc
Chloride	Gasoline	Picloram	

Table 3 outlines the guidelines which are being or have been developed and are awaiting approval through the Federal-Provincial-Territorial process. All current public consultation documents are available on Health Canada's website at **www.healthcanada.gc.ca/waterquality**.

Table 3. Proposed Guidelines (not yet approved)

Parameter	Proposed guideline (mg/L)	
	MAC[a]	**AO**[a]
Carbon Tetrachloride		
Chloral hydrate		
Chlorine		
Chlorite	1.0	
Chlorate	1.0	
Chlorine dioxide	NNGP[a]	
Corrosion control		
Haloacetic Acids—Total (HAAs)		
2-Methyl-4-chlorophenoxyacetic acid (MCPA)		
Potassium		
Radiological Parameters		

[a] MAC = maximum acceptable concentration; AO = aesthetic objective; NNGP = no numerical guideline proposed.

Guidelines for microbiological parameters

Bacteriological guidelines

Escherichia coli

The maximum acceptable concentration (MAC) of *Escherichia coli* in public, semi-public, and private drinking water systems is none detectable per 100 mL.

Testing for *E. coli* should be carried out in all drinking water systems. The number, frequency, and location of samples for *E. coli* testing will vary according to the type and size of the system.

Total coliforms

The MAC of total coliforms in water leaving a treatment plant in a public system and throughout semi-public and private supply systems is none detectable per 100 mL.

For distribution systems in public supplies where fewer than 10 samples are collected in a given sampling period, no sample should contain total coliform bacteria. In distribution systems where greater than 10 samples are collected in a given sampling period, no consecutive samples from the same site or not more than 10% of samples should show the presence of total coliform bacteria.

Testing for total coliforms should be carried out in all drinking water systems. The number, frequency, and location of samples for total coliform testing will vary according to the type and size of the system.

Heterotrophic plate count

No MAC is specified for heterotrophic plate count (HPC) bacteria in water supplied by public, semi-public, or private drinking water systems. Instead, increases in HPC concentrations above baseline levels are considered undesirable.

Emerging pathogens

No MAC for current or emerging bacterial waterborne pathogens has been established. Current bacterial waterborne pathogens include those that have been previously linked to gastrointestinal illness in human populations. Emerging bacterial waterborne pathogens include, but are not limited to, L*egionella*, *Mycobacterium avium* complex, *Aeromonas hydrophila*, and *Helicobacter pylori*.

Protozoa

Although *Giardia* and *Cryptosporidium* can be responsible for severe and, in some cases, fatal gastrointestinal illness, it is not possible to establish MACs for these protozoa in drinking water at this time. Routine methods available for the detection of cysts and oocysts suffer from low recovery rates and do not provide any information on their viability or human infectivity. Nevertheless, until better monitoring data and information on the viability and infectivity of cysts and oocysts present in drinking water are available, measures should be implemented to reduce the risk of illness as much as possible. If the presence of viable, human-infectious cysts or oocysts is known or suspected in source waters, or if *Giardia* or *Cryptosporidium* has been responsible for past waterborne outbreaks in a community, a treatment and distribution

regime and a watershed or wellhead protection plan (where feasible) or other measures known to reduce the risk of illness should be implemented. Treatment technologies in place should achieve at least a 3-log reduction in and/or inactivation of cysts and oocysts, unless source water quality requires a greater log reduction and/or inactivation.

Viruses

Although enteric viruses can be responsible for severe and, in some cases, fatal illnesses, it is not possible to establish MACs for enteric viruses in drinking water at this time. Treatment technologies and watershed or wellhead protection measures known to reduce the risk of waterborne outbreaks should be implemented and maintained if source water is subject to faecal contamination or if enteric viruses have been responsible for past waterborne outbreaks. Where treatment is required, treatment technologies should achieve at least a 4-log reduction and/or inactivation of viruses.

Boil Water Advisories

General guidance on the issuing and rescinding of boil water advisories is provided. In the event of an advisory, a rolling boil for 1 minute is considered adequate.

Turbidity

Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet the following health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters:

1. For **chemically assisted filtration**, shall be less than or equal to **0.3 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 1.0 NTU at any time.
2. For **slow sand or diatomaceous earth filtration**, shall be less than or equal to **1.0 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 3.0 NTU at any time.
3. For **membrane filtration**, shall be less than or equal to **0.1 NTU** in at least 99% of the measurements made, or at least 99% of the time each calendar month, and shall not exceed 0.3 NTU at any time. If membrane filtration is the sole treatment technology employed, some form of virus inactivation[1] should follow the filtration process.

It is not expected that all water supplies will be able to meet this revised turbidity guideline immediately. Therefore, supplementary treatment should be considered in the interim to ensure delivery of safe drinking water.

[1] Some form of virus inactivation is required for all technologies. The difference is that chemically assisted, slow sand and diatomaceous earth filters are credited with log virus reductions and membrane filters receive no credit.

Guidelines for Chemical and Physical Parameters

Table 4 provides the complete list of all current numerical Guidelines for chemical and physical parameters. Parameters for which the health-based guideline was developed as an interim maximum acceptable concentration (IMAC) are identified with an asterisk (*) in the table below. The use of these 'interim' MACs was discontinued by the Federal-Provincial-Territorial Committee on Drinking Water in 2003. For more information on specific guidelines, please refer to the guideline technical document for the parameter of concern.

Table 4. Parameters with Guidelines

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
Aldicarb	0.009		1994
Aldrin + dieldrin	0.0007		1994
Aluminum[a]		[0.1/0.2]	1998
*Antimony[b]	0.006		1997
Arsenic	0.01		2006
*Atrazine + metabolites	0.005		1993
Azinphos-methyl	0.02		2005
Barium	1		1990
Bendiocarb	0.04		1986
Benzene	0.005		1986
Benzo[a]pyrene	0.00001		(2005)
*Boron	5		1990
*Bromate	0.01		1998
Bromodichloromethane (BDCM)	0.016		2006
*Bromoxynil	0.005		(2005)
Cadmium	0.005		(2005)
Carbaryl	0.09		(2005)
Carbofuran	0.09		(2005)
Carbon tetrachloride	0.005		1986
Chloramines—total	3		1995
Chloride		≤250	(2005)
Chlorpyrifos	0.09		1986

Table 4. *(cont'd)*

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
Chromium	0.05		1986
Colour[d]		≤15 TCU	2005
Copper[b]		≤1.0	1992
*Cyanazine	0.01		(2005)
Cyanide	0.2		1991
Cyanobacterial toxins–Microcystin-LR[c]	0.0015		2002
Diazinon	0.02		(2005)
Dicamba	0.12		(2005)
1,2-Dichlorobenzene[e]	0.2	≤0.003	1987
1,4-Dichlorobenzene[e]	0.005	≤0.001	1987
*1,2-Dichloroethane	0.005		1987
1,1-Dichloroethylene	0.014		1994
Dichloromethane	0.05		1987
2,4-Dichlorophenol,	0.9	≤0.0003	(2005)
*2,4-Dichlorophenoxyacetic acid (2,4 -D)	0.1		1991
Diclofop-methyl	0.009		1987
*Dimethoate	0.02		(2005)
Dinoseb	0.01		1991
Diquat	0.07		(2005)
Diuron	0.15		(2005)
Ethylbenzene		≤0.0024	1986
Fluoride	1.5		1996
*Glyphosate	0.28		2005
Iron		≤0.3	(2005)
Lead[b]	0.01		1992
Malathion	0.19		(2005)
Manganese		≤0.05	1987
Mercury	0.001		1986
Methoxychlor	0.9		(2005)
Methyl *tertiary*-butyl ether (MTBE)		0.015	2006
*Metolachlor	0.05		1986
Metribuzin	0.08		(2005)

Table 4. *(cont'd)*

Parameter	MAC (mg/L)	AO [or OG] (mg/L)	Year of approval (or reaffirmation)
Monochlorobenzene	0.08	≤0.03	1987
Nitrate[f]	45		1987
Nitrilotriacetic acid (NTA)	0.4		1990
Odour		Inoffensive	(2005)
*Paraquat (as dichloride)[g]	0.01		(2005)
Parathion	0.05		1986
Pentachlorophenol	0.06	≤0.030	1987
pH		6.5–8.5	1995
Phorate	0.002		(2005)
*Picloram	0.19		(2005)
Selenium	0.01		1992
*Simazine	0.01		1986
Sodium[i]		≤200	1992
Sulphate[j]		≤500	1994
Sulphide (as H_2S)		≤0.05	1992
Taste		Inoffensive	(2005)
Temperature		≤15°C	(2005)
*Terbufos	0.001		(2005)
Tetrachloroethylene	0.03		1995
2,3,4,6-Tetrachlorophenol	0.1	≤0.001	(2005)
Toluene		≤0.024	2005
Total dissolved solids (TDS)		≤500	1991
Trichloroethylene	0.005		(2005)
2,4,6-Trichlorophenol	0.005	≤0.002	(2005)
*Trifluralin	0.045		(2005)
Trihalomethanes-total (THMs)[k]	0.1		2006
Turbidity[l]	0.3/ 1.0/ 0.1 NTU		2004
*Uranium	0.02		1999
Vinyl chloride	0.002		1992
Xylenes—total		≤0.3	(2005)
Zinc[b]		≤5.0	(2005)

Table 4. *(cont'd)*

Notes:

a This is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance values of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

b Faucets should be thoroughly flushed before water is taken for consumption or analysis.

c The guideline is considered protective of human health against exposure to other microcystins (total microcystins) that may also be present.

d TCU = true colour unit.

e In cases where total dichlorobenzenes are measured and concentrations exceed the most stringent value (0.005 mg/L), the concentrations of the individual isomers should be established.

f Equivalent to 10 mg/L as nitrate–nitrogen. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3.2 mg/L.

g Equivalent to 0.007 mg/L for paraquation.

h No units.

i It is recommended that sodium be included in routine monitoring programmes, as levels may be of interest to authorities who wish to prescribe sodium-restricted diets for their patients.

j There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.

k Expressed as a running annual average. The guideline is based on the risk associated with chloroform, the trihalomethane.

l Refer to section on guidelines for microbiological parameters for information related to various treatment processes.

Parameters without Guidelines

Some chemical and physical parameters for which a Guideline Technical Document is available have been identified as not requiring a numerical guideline, because currently available data indicate that it poses no health risk or aesthetic problem at the levels generally found in drinking water in Canada.

Table 5. Parameters without numerical guidelines

Ammonia	Asbestos
Calcium	Formaldehyde
Gasoline	Hardness[a]
Magnesium	Radon
Silver	

Note:

a Public acceptance of hardness varies considerably. Generally, hardness levels between 80 and 100 mg/L (as CaCO3) are considered acceptable; levels greater than 200 mg/L are considered poor but can be tolerated; those in excess of 500 mg/L are normally considered unacceptable. Where water is softened by sodium ion exchange, it is recommended that a separate, unsoftened supply be retained for culinary and drinking purposes.

Archived parameters

The Federal-Provincial-Territorial Committee on Drinking Water has established a science-based process to systematically review older guidelines and archive older guidelines which are no longer required. Guidelines are archived for parameters which are no longer found in Canadian drinking water supplies at levels that could pose a risk to human health, including pesticides which are no longer registered for use in Canada, and for mixtures of contaminants that are addressed individually. Table 6 provides the list of parameters whose guidelines have been archived as a result of this review.

Table 6. Parameters that have been archived[a]

Chlordane (total isomers)[b]	Polychlorinated biphenyls (PCBs)
Dichlorodiphenyltrichloroethane (DDT) + metabolites[b]	Polycyclic aromatic hydrocarbons (PAH)[c]
Endrin[b]	Resin acids
Heptachlor + heptachlor epoxide[b]	Tannin
Lignin[b]	Temephos[d]
Lindane[b]	Total organic carbon (TOC)
Methyl-parathion[b]	Toxaphene[b]
Mirex	Triallate[d]
Pesticides (total)	2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)[d]
Phenols (total)	2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP)[b]
Phthalic acid esters (PAE)	

Notes:

a Published in the 1978 version of the *Supporting Documentation* for these parameters (available upon request).

b In 1978 'Pesticides' Supporting Documentation.

c Other than benzo[a]pyrene.

d No documentation available.

Guidelines for radiological parameters (Under review, consultation completed)

In setting dose guidelines for radionuclides in drinking water, it is recognized that water consumption contributes only a portion of the total radiation dose and that some radionuclides present are natural in origin and therefore cannot be excluded. Consequently, maximum acceptable concentrations for radionuclides in drinking water have been derived based on a committed effective dose of 0.1 mSv[2] from one year's consumption of drinking water. This dose represents less than 5% of the average annual dose attributable to natural background radiation.

To facilitate the monitoring of radionuclides in drinking water, the reference level of dose is expressed as an activity concentration, which can be derived for each radionuclide from published radiological data. The National Radiological Protection Board has calculated dose conversion factors (DCFs) for radionuclides based on metabolic and dosimetric

[2] Sievert (Sv) is the unit of radiation dose. It replaces the old unit, rem (1 rem = 0.01 Sv)

models for adults and children. Each DCF provides an estimate of the 50-year committed effective dose resulting from a single intake of 1 Bq[3] of a given radionuclide.

The MACs of radionuclides in public water supplies are derived from adult DCFs, assuming a daily water intake of 2 L, or 730 L/year, and a maximum committed effective dose of 0.1 mSv, or 10% of the International Commission on Radiological Protection limit on public exposure:

$$\text{MAC (Bq/L)} = \frac{1 \times 10^{-4}\ \text{(Sv/year)}}{730\ \text{(L/year)} \times \text{DCF (Sv/Bq)}}$$

When two or more radionuclides are found in drinking water, the following relationship should be satisfied:

$$\frac{C_1}{MAC_1} + \frac{c_2}{MAC_2} + \cdots \frac{c_i}{MAC_i} \leq 1$$

where C_i and MAC_i are the observed and maximum acceptable concentrations, respectively, for each contributing radionuclide.

MACs for radionuclides that should be monitored in water samples are listed in Table 7. If a sample is analysed by gamma-spectroscopy, additional screening for radionuclides that may be present under certain conditions can be performed. MACs for these radionuclides are given in Table 8. MACs for a number of additional radionuclides, both natural and artificial, can be found in the sixth edition of the guidelines booklet.

Water samples may be initially screened for radioactivity using techniques for gross alpha and gross beta activity determinations. Compliance with the guidelines may be inferred if the measurements for gross alpha and gross beta activity are less than 0.1 Bq/L and 1 Bq/L, respectively, as these are lower than the strictest MACs. Sampling and analyses should be carried out often enough to accurately characterize the annual exposure. If the source of the activity is known, or expected, to be changing rapidly with time, then the sampling frequency should reflect this factor. If there is no reason to suppose that the source varies with time, then the sampling may be done annually. If measured concentrations are consistent and well below the reference levels, this would be an argument for reducing the sampling frequency. On the other hand, the sampling frequency should be maintained, or even increased, if concentrations are approaching the reference levels. In such a case, the specific radionuclides should be identified and individual activity concentrations measured.

[3] Becquerel (Bq) is the unit of activity of a radioactive substance, or the rate at which transformations occur in the substance. One becquerel is equal to one transformation per second and is approximately equal to 27 picocuries (pCi).

Table 7. Primary List of Radionuclides

Radionuclide		Half-life t1/2	DCF (Sv/Bq)	MAC (Bq/L)
Natural radionuclides				
Lead-210	^{210}Pb	22.3 years	1.3×10^{-6}	0.1
Radium-224	^{224}Ra	3.66 days	8.0×10^{-8}	2
Radium-226	^{226}Ra	1600 years	2.2×10^{-7}	0.6
Radium-228	^{228}Ra	5.76 years	2.7×10^{-7}	0.5
Thorium-228	^{228}Th	1.91 years	6.7×10^{-8}	2
Thorium-230	^{230}Th	7.54×10^{4} years	3.5×10^{-7}	0.4
Thorium-232	^{232}Th	1.40×10^{10} years	1.8×10^{-6}	0.1
Thorium-234	^{234}Th	24.1 days	5.7×10^{-9}	20
Uranium-234[a]	^{234}U	2.45×10^{5} years	3.9×10^{-8}	4
Uranium-235[a]	^{235}U	7.04×10^{8} years	3.8×10^{-8}	4
Uranium-238[a]	^{238}U	4.47×10^{9} years	3.6×10^{-8}	4
Artificial radionuclides				
Cesium-134	^{134}Cs	2.07 years	1.9×10^{-8}	7
Cesium-137	^{137}Cs	30.2 years	1.3×10^{-8}	10
Iodine-125	^{125}I	59.9 days	1.5×10^{-8}	10
Iodine-131	^{131}I	8.04 days	2.2×10^{-8}	6
Molybdenum-99	^{99}Mo	65.9 hours	1.9×10^{-9}	70
Strontium-90	^{90}Sr	29 years	2.8×10^{-8}	5
Tritium[b]	^{3}H	12.3 years	1.8×10^{-11}	7000

Notes:

a The activity concentration of natural uranium corresponding to the chemical guideline of 0.02 mg/L (see separate guideline technical document on uranium) is about 0.5 Bq/L.

b Tritium is also produced naturally in the atmosphere in significant quantities.

Table 8. Secondary list of radionuclides

Radionuclide		Half-life t1/2	DCF (Sv/Bq)	MAC (Bq/L)
Natural radionuclides				
Beryllium-7	^{7}Be	53.3 days	3.3×10^{-11}	4000
Bismuth-210	^{210}Bi	5.01 days	2.1×10^{-9}	70
Polonium-210	^{210}Po	138.4 days	6.2×10^{-7}	0. 2
Artificial radionuclides				
Americium-241	^{241}Am	432 years	5.7×10^{-7}	0. 2
Antimony-122	^{122}Sb	2.71 days	2.8×10^{-9}	50
Antimony-124	^{124}Sb	60.2 days	3.6×10^{-9}	40
Antimony-125	^{125}Sb	2.76 years	9.8×10^{-10}	100
Barium-140	^{140}Ba	12.8 days	3.7×10^{-9}	40
Bromine-82	^{82}Br	35.3 hours	4.8×10^{-10}	300
Calcium-45	^{45}Ca	165 days	8.9×10^{-10}	200
Calcium-47	^{47}Ca	4.54 days	2.2×10^{-9}	60
Carbon-14a	^{14}C	5730 years	5.6×10^{-10}	200
Cerium-141	^{141}Ce	32.5 days	1.2×10^{-9}	100
Cerium-144	^{144}Ce	284.4 days	8.8×10^{-9}	20
Cesium-131	^{131}Cs	9.69 days	6.6×10^{-11}	2000
Cesium-136	^{136}Cs	13.1 days	3.0×10^{-9}	50
Chromium-51	^{51}Cr	27.7 days	5.3×10^{-11}	3000
Cobalt-57	^{57}Co	271.8 days	3.5×10^{-9}	40
Cobalt-58	^{58}Co	70.9 days	6.8×10^{-9}	20
Cobalt-60	^{60}Co	5.27 years	9.2×10^{-8}	2
Gallium-67	^{67}Ga	78.3 hours	2.6×10^{-10}	500
Gold-198	^{198}Au	2.69 days	1.6×10^{-9}	90
Indium-111	^{111}In	2.81 days	3.9×10^{-10}	400
Iodine-129	^{129}I	1.60×10^{7} years	1.1×10^{-7}	1
Iron-55	^{55}Fe	2.68 years	4.0×10^{-10}	300
Iron-59	^{59}Fe	44.5 days	3.1×10^{-9}	40
Manganese-54	^{54}Mn	312.2 days	7.3×10^{-10}	200
Mercury-197	^{197}Hg	64.1 hours	3.3×10^{-10}	400
Mercury-203	^{203}Hg	46.6 days	1.8×10^{-9}	80
Neptunium-239	^{239}Np	2.35 days	1.2×10^{-9}	100
Niobium-95	^{95}Nb	35.0 days	7.7×10^{-10}	200
Phosphorus-32	^{32}P	14.3 days	2.6×10^{-9}	50
Plutonium-238	^{238}Pu	87.7 years	5.1×10^{-7}	0.3
Plutonium-239	^{239}Pu	2.41×10^{4} years	5.6×10^{-7}	0.2

Table 8. *(cont'd)*

Radionuclide		Half-life t1/2	DCF (Sv/Bq)	MAC (Bq/L)
Plutonium-240	^{240}Pu	6560 years	5.6×10^{-7}	0.2
Plutonium-241	^{241}Pu	14.4 years	1.1×10^{-8}	10
Rhodium-105	^{105}Rh	35.4 hours	5.4×10^{-10}	300
Rubidium-81	^{81}Rb	4.58 hours	5.3×10^{-11}	3000
Rubidium-86	^{86}Rb	18.6 days	2.5×10^{-9}	50
Ruthenium-103	^{103}Ru	39.2 days	1.1×10^{-9}	100
Ruthenium-106	^{106}Ru	372.6 days	1.1×10^{-8}	10
Selenium-75	^{75}Se	119.8 days	2.1×10^{-9}	70
Silver-108m	^{108m}Ag	127 years	2.1×10^{-9}	70
Silver-110m	^{110m}Ag	249.8 days	3.0×10^{-9}	50
Silver-111	^{111}Ag	7.47 days	2.0×10^{-9}	70
Sodium-22	^{22}Na	2.61 years	3.0×10^{-9}	50
Strontium-85	^{85}Sr	64.8 days	5.3×10^{-10}	300
Strontium-89	^{89}Sr	50.5 days	3.8×10^{-9}	40
Sulphur-35	^{35}S	87.2 days	3.0×10^{-10}	500
Technetium-99	^{99}Tc	2.13×10^{5} years	6.7×10^{-10}	200
Technetium-99m	^{99m}Tc	6.01 hours	2.1×10^{-11}	7000
Tellurium-129m	^{129m}Te	33.4 days	3.9×10^{-9}	40
Tellurium-131m	^{131m}Te	32.4 hours	3.4×10^{-9}	40
Tellurium-132	^{132}Te	78.2 hours	3.5×10^{-9}	40
Thallium-201	^{201}Tl	3.04 days	7.4×10^{-11}	2000
Ytterbium-169	^{169}Yb	32.0 days	1.1×10^{-9}	100
Yttrium-90	^{90}Y	64 hours	4.2×10^{-9}	30
Yttrium-91	^{91}Y	58.5 days	4.0×10^{-9}	30
Zinc-65	^{65}Zn	243.8 days	3.8×10^{-9}	40
Zirconium-95	^{95}Zr	64.0 days	1.3×10^{-9}	100

Note:

a ^{14}C is also produced naturally in the atmosphere in significant quantities.

3 Roles and Responsibilities

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3.1 Roles and Responsibilities for Ensuring Safe Drinking Water in First Nations Communities

Responsibility for ensuring safe drinking water in First Nations communities is shared between the First Nations communities and the Government of Canada. First Nations Chief and Council take the lead in planning and developing their own capital facilities, as well as the day-to-day operation of water and wastewater systems.

Indian and Northern Affairs Canada (INAC) provides funding, assistance and advice for water services infrastructure, including the design, construction, upgrading, operation, and maintenance of water systems on First Nations reserves. INAC also funds the training of staff such as water treatment plant operators.

Environment Canada's (EC) activities include developing technical guidance materials for First Nations, collaborating to help train First Nations communities in the use of technical guidance materials through regional workshops, helping First Nations to take action on source water protection and sustainable water use, providing information on federal requirements that apply to the release of wastewater effluents, and the environmental review of infrastructure projects.

Health Canada has collaborated with the provinces and territories over the past 30 years to establish the *Guidelines for Canadian Drinking Water Quality* (GCDWQ). Currently, drinking water quality in First Nations communities is not provincially or federally legislated.

Health Canada has provided an Environmental Health Program to First Nations communities for more than 50 years. As part of the Environmental Health Program and through the Drinking Water Safety Program (DWSP), Health Canada works in partnership with more than 700 First Nations communities south of 60°. Under the First Nations and Inuit transfer initiative, the Environmental Health Program is transferable to First Nations communities. To date, a small number of communities have taken direct management and control of environmental health programs.

Health Canada works with First Nations communities to protect public health by ensuring verification monitoring programs are in place to provide a final check on the overall safety of drinking water at tap, in distribution systems with five or more connections, and water in cisterns and community wells[1].

Environment Canada, INAC/Public Works and Government Services Canada (PWGSC), and Health Canada are to follow an integrated review process for new and upgraded drinking water and wastewater system project proposals in First Nations communities. Health Canada's role is to review project proposals to determine

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

whether they contain adequate measures to prevent, remedy, or mitigate any factors that could threaten public health. Within the First Nations and Inuit Health Branch (FNIHB), the Office of Community Medicine (OCM) has an advocacy and advisory role on public health issues. The OCM is the focal point within the FNIHB for contact with Regional Medical Officers. It provides coordination and information-sharing among the regional offices, and between the regions and FNIHB headquarters. The OCM is also the primary link with other public health organizations such as the Public Health Agency of Canada and the Canadian Council of Regional Medical Officers ensuring that First Nations issues are considered in national plans and programs.

FNIHB's Communicable Disease Control Division's assistance may be requested by FNIHB Regional Offices in the event of a documented or suspected outbreak of enteric disease. A detailed investigation and additional resources may be required to:

1) determine if the outbreak is related to the water supply; and
2) implement appropriate disease control measures.

The Office of Nursing Services (ONS) plays a leadership role in the development and implementation of community-based, client-focused and integrated primary health care services. Working in close collaboration with other FNIHB professionals, the ONS is involved in the analysis of health trends and issues to promote quality health services to our clients.

3.2 Objectives of the Drinking Water Safety Program

The objectives of FNIHB's Drinking Water Safety Program (DWSP) are:

- To sample, test and interpret drinking water quality in distribution systems with five or more connections, and water in cisterns and community wells[1];
- To reduce potential public health risks associated with potential water contamination, waterborne illnesses and outbreaks through a coordinated compliance reporting regime;
- To build capacity of First Nations through community-based drinking water quality monitoring programs;
- To promote the importance of safe drinking water through increased public awareness and education, including education on the health effects of contamination.

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

3.3 Commitment to the Drinking Water Safety Program

Effective drinking water safety programs are based on the commitment of each participating stakeholder to work cooperatively toward the ultimate goal of protecting public health. For this reason, individual stakeholders involved in ensuring safe drinking water in First Nations communities south of 60° play a significant role in the safety of the drinking water system. Effective leadership and organizational commitment are also essential to the success of the drinking water safety program. In general, First Nations Band Councils have the overall responsibility for ensuring that water treatment facilities and distribution systems, cisterns and community wells[1] are designed, constructed, maintained, operated, and monitored in accordance with established federal or provincial standards.

Participants in DWSPs should include those responsible for:

- Source water protection;
- Drinking water treatment and distribution;
- Drinking water quality monitoring; and
- Public health and primary health care surveillance.

The aim of having stakeholders committed to the FNIHB's DWSP is a coordinated, community-based approach to ensuring safe drinking water in First Nations communities. In the event that drinking water parameters do not meet the *Guidelines for Canadian Drinking Water Quality*, this approach will facilitate the rapid exchange of information on remedial measures and communication processes.

The recommended stakeholders are:

- Community residents;
- Chief and Council;
- Environmental Health Officer (EHO);
- Regional Medical Officer (RMO);
- Circuit Rider Training Program representative;
- Community Health Nurse (CHN);
- Community Health Representative (CHR);
- Water Treatment Plant Operator (WTPO);
- Community-Based Drinking Water Quality Monitor (CBWM);
- Indian and Northern Affairs Canada (INAC) representative;
- Environment Canada (EC) representative; and
- First Nations' Technical Organizations representative.

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

3.4 Environmental Health Officers

The Environmental Health Officer (EHO) must possess a Certificate in Public Health Inspection and be certified with the Canadian Institute of Public Health Inspectors.

The EHO's responsibilities related to, but not limited to, drinking water include the following:

Monitoring

- Participating in the planning, development, implementation, and evaluation of drinking water quality programs;
- Monitoring drinking water quality to assess compliance of distribution systems (five or more connections) and cisterns with the latest edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ);
- Interpreting drinking water results submitted by Community-Based Drinking Water Quality Monitors (CBWMs);
- Participating in planning and responding to emergencies related to the contamination of community drinking water supplies, to ensure the protection of community health (this response includes investigating the situation and recommending solutions);
- Participating in investigations of waterborne disease outbreaks and of health events;
- Assisting with the Community-Based Drinking Water Quality Monitoring Program's responsibilities for sampling and testing of drinking water;
- In the absence of the CBWM, covering the CBWM's sampling and testing responsibilities to the best of his/her abilities;
- Maintaining quality assurance and quality control in communities where the First Nations and Inuit Health Branch (FNIHB) is facilitating drinking water sampling and testing through the support and training of Community-Based Drinking Water Quality Monitors;
- Liaising and communicating with First Nations leadership and the municipal, provincial and federal governments to establish integrated emergency response planning for First Nations communities and surrounding areas;
- Maintaining the integrity of water quality samples and testing procedures by ensuring the implementation of a Quality Assurance/Quality Control (QA/QC) Program; and
- Advocating, with support from the Community Health Nurse, for clean, safe and reliable drinking water in the community.

Education and Training

- Delivering training and educational material to the community on topics such as shock chlorination, water sampling, cistern cleaning, and disinfection;
- Conducting training and education sessions for the health committee, First Nations community employees, and community members on topics such as community-based drinking water quality monitoring;
- Providing information and advice for improving drinking water quality to the First Nations leadership and federal, provincial, and municipal departments; and
- Providing training to the the CBWMs in communities where FNIHB is facilitating drinking water sampling and testing through the support of community-based drinking water quality monitoring.

Data Management and Analysis

- Writing reports and other related correspondence, including syntheses and analyses of information gathered from monitoring, inspections, investigations, and audits;
- Reviewing, interpreting and disseminating drinking water quality sampling results to First Nations communities and, depending on the nature of the results, to other stakeholders; and
- Communicating recommendations, such as issuing or lifting a boil water advisory to the appropriate stakeholders in the event of unsatisfactory results.

Review Process for New Proposals for Water and Wastewater Systems

- Providing assistance to FNIHB's Regional Environmental Health Managers (REHMs) in the review of proposals for projects to build or upgrade water and wastewater systems, to determine whether they contain adequate measures to prevent, remedy, or mitigate any factors that could threaten public health; and
- Providing comments at the feasibility, pre-design and design stage.

3.5 Regional Medical Officers

FNIHB regional offices employ public health physicians to provide public health services to First Nations on reserve. The term Regional Medical Officer (RMO) is used to collectively describe this group of medical professionals. While the specific roles and responsibilities of RMOs may vary from jurisdiction to jurisdiction, they always include responsibilities related to public health and safety. The RMOs employed by FNIHB fulfil many of the same functions as a provincial MOH, regardless of their designation under provincial law. Their roles and the scope of their duties also vary according to the needs of the communities they serve. RMOs must collaborate closely with provincial MOHs and community leaders to ensure that public health needs are met.

The roles and responsibilities of the RMOs will vary depending on the needs of the communities in their region, but generally include the following:

- Providing public health advice and recommendations for communicable disease control and prevention;
- Providing public health advice and recommendations on environmental health issues for communities and EHOs;
- Providing leadership in emergency situations that could potentially negatively affect public health;
- Overseeing health surveillance activities;
- Working with the provinces and physicians on primary care initiatives and services for community residents;
- Consulting on health promotion and disease prevention initiatives;
- Recommending, developing, and implementing public policies in support of improved health;
- Managing public health programs, including planning, implementation, and evaluation; and
- Educating other health care providers.

Appropriate Public Health Legislation

All public health legislation (and a variety of related legislation) includes provisions related to waterborne disease control and environmental health. Medical Officers designated by legislation have specific duties and authority related to these issues.

Public health in Canada falls under the legislative authority of the provincial governments. Authority to enforce provincial public health legislation is given to designated physicians by the relevant provincial Minister of Health, and these Medical Officers have specific duties and authorities under the legislation. In some jurisdictions, this authority may be delegated to an RMO employed by a First Nations community or by the federal government. In other jurisdictions, RMOs employed by the community and federal government will have

to collaborate closely with the provincially authorized MOH in certain situations if the relevant *Public Health Act* is to be applied.

RMOs in First Nations Communities

The complete roles and responsibilities of RMOs working in First Nations communities will vary, depending on public health legislation and prevailing standards and practices in the provinces. Many of the functions outlined above may be included upon mutual agreement between the physician and the community representatives. However, each community must allocate the appropriate resources and ensure that the RMO is able to provide services related to public health and safety. A qualified RMO should be available by phone at all times and should be able to visit the community if urgent situations arise.

In general, the RMO should work proactively with Chief and Council and the Environmental Health Officer (EHO) in the community to assess all aspects of public health related to water to ensure that the drinking water supply is clean, safe, and reliable, and that any risks or problems are identified as soon as possible.

The RMO's responsibilities related to water quality could also include the following:

Boil Water Orders

- Boil Water Orders (BWOs) are issued and lifted by RMOs with designated authority under the relevant *Public Health Act.*

Communicable Disease Control

- Ensuring that procedures are in place for the timely reporting of all waterborne disease outbreaks;
- Reviewing waterborne disease reports in a timely, on-going fashion and on a quarterly basis;
- Writing a waterborne disease summary for submission to the appropriate health agency and to FNIHB on an annual basis;
- Promptly notifying all appropriate stakeholders of any waterborne disease outbreaks where an emergency response may be required;
- Making recommendations on appropriate laboratory specimens to be submitted for diagnosis and follow-up of waterborne diseases;
- Ensuring that appropriate procedures are in place for collecting, storing and handling samples used in the diagnosis of waterborne disease;
- Providing advice on the interpretation of laboratory reports; and
- Giving advice on diagnosis and treatment to local family physicians and nurses providing such services to First Nations communities.

Outbreak Management

In situations involving waterborne disease outbreaks, the RMO may act in an advisory capacity for community and provincial officials, or may assume the lead. The lead role would include the following:

- Determining when and where a waterborne disease outbreak has occurred;
- Undertaking appropriate investigation of the outbreak;
- Ensuring that all key stakeholders are involved and kept aware of developments; and
- Taking appropriate measures to control outbreaks.

Case Management and Follow-up

For patients with a reportable waterborne disease, RMOs advise on the following matters may be required to ensure that:

- Appropriate medical treatment has been instituted;
- Patient education and (or) counselling has taken place;
- An appropriate interview has taken place to determine the source of infection;
- Where appropriate, an interview has taken place to identify and undertake preventive therapy and (or) testing of possible contacts;
- Where necessary, mechanisms are in place to ensure that therapy is completed; and
- Appropriate action is taken in situations in which individuals with a communicable disease may, by their actions, be placing others at risk.

Contact Tracing

The RMO may make recommendations on the identification, counseling, testing, and follow up of contacts of patients with waterborne diseases.

Source of Infection

Where indicated, the RMO will ensure that appropriate follow-up action has been undertaken to reduce the risk of waterborne disease in the future. This will involve extensive liaison with Chief and Band Council, Environmental Health Officers (EHOs), Community Health Representatives (CHRs), Community Health Nurses, physicians, and others.

Environmental Health

The RMO will work with other personnel, particularly EHOs, to give assistance by:

- Providing advice on the possible health effects of environmental factors; and
- Investigating health concerns to determine potential associations with environmental factors.

Emergency Response

The RMO should ensure that communities have appropriate emergency response plans. The RMO also plays a key role in the following situations:

- Emergencies involving waterborne diseases or having the potential for giving rise to outbreaks;
- Environmental situations in which a risk to health is imminent; and
- Situations involving the rapid relocation of community residents.

3.6 Community Health Nurses

Community Health Nurses (CHNs) play a key role in the identification of waterborne disease during communicable disease outbreaks, in liaison with other public health professionals, since they are often the sole on-site public health and primary health care practitioners.

CHNs are supported by a regional team of public health professionals, including Regional Medical Officers (RMOs), Community Medicine Specialists, Nurse Epidemiologists, and Environmental Health Officers (EHOs), who work together to ensure the delivery of public health services within First Nation communities.

CHNs responsibilities include the following:

- Mitigating risks and threats through the practice of health promotion and disease prevention;
- Detecting health risks by monitoring local morbidity trends;
- Identifying trends that may indicate potential waterborne disease outbreaks in a timely fashion and notifying the RMO and the EHOs; and,
- Supporting individuals, families, and communities throughout outbreak or other water-related emergencies.

Specific Activities:

- Advocating for clean, safe, and reliable water in the community;
- Being acutely aware of local morbidity patterns and their possible relationship to water-related disease;
- Identifying clients with symptoms that suggest waterborne disease, consulting with community physician/RMO, conducting required testing, and providing treatment accordingly;
- Collecting specimens from clients and sending specimens to a laboratory for appropriate testing;
- Reporting notifiable disease to the appropriate provincial Public Health authority;
- Monitoring and carrying out surveillance of waterborne disease outbreaks;
- Supporting EHOs' health education for clients, staff, and other community members on all aspects of disease prevention during a disease outbreak or Boil Water Advisory/Order; and
- Reporting cases of waterborne disease according to the provincial *Public Health Acts*.

3.7 Community Health Representatives

In many First Nations communities, the Community Health Representatives (CHRs) play a key role in enhancing the Environmental Health Programs in First Nations communities. CHRs work in conjunction with public health and primary health care professionals to promote healthy life choices. Health Canada recommends to First Nations communities the following CHR activities in carrying out a drinking water safety program, in consultation with the Community Health Nurse (CHN) and/or the Environmental Health Officer (EHO):

- Coordinating initiatives to educate the public about water resource protection;
- Providing information, both of a general nature and on specific community drinking water quality issues (this could include the production of posters and pamphlets and the organization of speaking events and town meetings);
- Mitigating risks and threats through the practice of health promotion and disease prevention;
- Reporting observations that may indicate potential waterborne disease outbreaks in a timely fashion by notifying the CHNs, who in turn notify the Regional Medical Officer (RMO);
- Supporting individuals, families, and communities during a waterborne disease outbreak or other water-related emergencies; and

Recommended Activities:

In consultation with the CHN and/or the EHO:

- Advocating for clean, safe and reliable water;
- Collaborating with community leaders, the EHOs, the RMO, epidemiologist, Health Director, and the CHN, for example, to ensure a safe water supply;
- Participating in the investigation and mitigation of waterborne disease outbreaks;
- Providing information to community members on appropriate follow-up to reduce the risk of waterborne disease in the future;
- Summarizing any communications or awareness activities and providing copies of any published articles or brochures to the Chief and Council, the EHO, the Health Director, the Nurse in Charge (NIC), and the CHN; and
- Developing and implementing a drinking water quality awareness program, in collaboration with Chief and Council, the EHO, the Health Director, the NIC, and the CHN.

Where designated as a Community-Based Drinking Water Quality Monitor (CBWM) by Chief and Council, the CHR will carry out water quality testing and sampling in the community's distribution systems with five or more connections, water in cisterns and community wells[1], and other duties that are the responsibility of a CBWM.

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

3.8 Community-Based Drinking Water Quality Monitors

The individual carrying out the Drinking Water Safety Program (DWSP) is referred to in this document as a Community-Based Drinking Water Quality Monitor (CBWM). The CBWM is responsible for sampling the treated drinking water within the community and testing the samples for bacteriological quality. This includes sampling and testing drinking water in distribution systems (with five or more connections) and water in cisterns and community wells[1]. Interpretation of the test results is the responsibility of the community's Environmental Health Officer (EHO). The CBWM is also responsible for disseminating results. The CBWM may also be a Community Health Representative (CHR), Water Treatment Plant Operator (WTPO), or another individual identified by Chief and Council. If a community does not have a CBWM, the activities are completed by the EHO.

The activities of CBWMs include, but are not limited to, the following:

- Sampling and testing the quality of drinking water in distribution systems and cisterns, as detailed in the sampling procedures developed in collaboration with the EHO, as per the *Canadian Guidelines for Drinking Water Quality* (GCDWQ);
- Recording all results on water quality data sheets each week and sending monthly reports to the EHO, Chief and Council, and WTPO;
- Performing quality assurance tests on testing media, as per the quality assurance plan developed in collaboration with the EHO as described in Chapter 7;
- Immediately upon determining that *Escherichia coli* and (or) total coliforms exceed the latest GCDWQ or when there are unusual changes in disinfectant residuals (e.g., they are lower than recommended), notifying the EHO for interpretation of the results and further action;
- Meeting regularly throughout the year, as required, with Chief and Council, the EHO, the Health Director (HD), the Nurse in Charge (NIC), the Community Health Nurse (CHN), and the CHR, and reporting orally on program activities (accomplishments, problems, etc.);

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

3.9 First Nations Communities That Carry Out Community-Based Drinking Water Monitoring Programs

The responsibilities of First Nations communities that carry out a community-based drinking water quality monitoring program include, but are not limited to,

- Designating the Community-Based Drinking Water Quality Monitor (CBWM);
- Ensuring that the CBWM is trained by a certified Environmental Health Officer (EHO);
- Maintaining a laboratory in a suitable location within the community; and
- Developing a sampling procedure in consultation with the EHO, that specifies
  - Frequency that a water source must be sampled
  - Number of samples taken per day and (or) week
  - Sampling locations
  - Sampling method; and
  - Communications strategy.
- Purchasing supplementary equipment and (or) chemicals as necessary;
- Developing and implementing a communications plan that includes the following:
  - Recording all results on water quality data sheets each week and sending monthly reports to the EHO, Chief and Council, and the WTPO;
  - Immediately upon determining that *Escherichia coli* and (or) total coliforms exceed the latest edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) or when there are unusual changes in disinfectant residuals (e.g., they are lower than recommended), notifying the EHO for interpretation of the results;
  - Taking follow-up actions when drinking water quality fails to meet the GCDWQ; and
- Submitting detailed quarterly reports to the regional FNIHB office of Health Canada, including
  - Copies of receipts from any purchases, travel and (or) salary
  - Confirmation of hiring and training of a CBWM, and

- Copies of all sampling results (data sheets) for the period agreed to, as provided by the CBWM to Chief and Council, the Health Director and the EHO. This information may also include, on request, a summary chart of water quality trends for the reporting period and should contain the following information:
  - Number of bacterial and (or) chemical samples taken, and
  - Sampling frequency of bacterial and (or) chemical sampling.

Ideally, this sampling procedure is to be reviewed yearly by Chief and Council, the EHO, the Health Director, the Nurse in Charge (NIC), the Community Health Nurse (CHN), the Community Health Representative (CHR), and the Water Treatment Plant Operator (WTPO).

3.10 Training for Community-Based Drinking Water Quality Monitors

Health Canada's regional FNIHB offices have regional-specific training packages for educating and training Community-Based Drinking Water Quality Monitors (CBWMs).

CBWMs are to be trained by an Environmental Health Officer (EHO) to meet at minimum nationally standardized general and specific learning outcomes, and evaluation strategies and activities as detailed in the national framework outlined below. Also included in the framework are suggested training strategies and activities, which cover each of the general learning outcomes.

CBWMs are to be evaluated by an EHO on an ongoing basis with a formal evaluation once per year, at a minimum. If a CBWM fails to meet all of the specific learning outcomes, the EHO will then be responsible for further training and evaluation of the CBWM, as well as for testing drinking water quality until the CBWM satisfactorily completes the learning outcomes. The EHO will track the training and evaluation results, which are to be reported upon yearly as part of the Treasury Board Secretariat Performance Indicators in the Water Management System database.

The framework is designed to be flexible, allowing regions and EHOs to develop and use their own training and evaluation programs as long as they meet the minimum general and specific learning outcomes outlined in the national framework.

Each community that has a designated CBWM must also have an alternate person (another CBWM or EHO) who will test the drinking water in the CBWM's absence.

National Framework for the Training and Evaluation of Community-Based Drinking Water Monitors

The objective of the National Framework for the Training and Evaluation of Community-Based Drinking Water Monitors is to provide regions with a general training and evaluation program for the CBWM.

The CBWM is responsible for sampling the treated drinking water within the community and testing the samples for bacteriological quality. This includes sampling and testing drinking water in distribution systems (with five or more connections) and water in cisterns and community wells[1] and disseminating the results.

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

Purpose

To build the capacity of First Nations communities to monitor the quality of their drinking water from a public health perspective.

Objective

To train individuals to a level that will ensure effective monitoring of drinking water quality according to an accepted national guideline framework and that will maximize Health Canada's confidence in drinking water quality results.

Principles

1) Hands-on learning;
2) Match teaching to individual's learning skills and educational level;
3) Understand the importance of CBWM's role in protecting public health;
4) Follow up once per year to:
   a) ensure potential problem areas are identified and corrected; and
   b) enhance learning.

I. General Learning Outcomes

The CBWM must satisfactorily complete all six general learning outcomes (tasks) set out below by the end of the training/evaluation:

1. Understands the implications of drinking water quality on public health.
2. Collects, identifies and stores sample(s) of drinking water.
3. Measures free chlorine residuals in the drinking water.
4. Analyses the drinking water sample for total coliforms and *E.coli.*
5. Applies Quality Assurance and Quality Control (QA/QC) techniques.
6. Reports water results to the EHO and other stakeholders.

II. Specific Learning Outcomes

In the following section the specific learning outcomes are presented in association with the appropriate general learning outcome. Section 3.11 details suggested training strategies and activities.

General and Specific Learning Outcomes

1. Understands the implications of drinking water quality on public health
   - 1.1 Understands the possible cause of contamination in the water, from source to tap
   - 1.2 Understands potential risks that contaminated drinking water could have on public health
   - 1.3 Understands the roles and responsibilities of the CBWM
   - 1.4 Understands the roles and responsibilities of the EHO
2. Collects, identifies and stores sample(s) of drinking water
   - 2.1 Follows the community's recommended sampling locations, frequency and number

2.2 Samples drinking water according to recommended procedures/protocols

2.3 Identifies the sample(s) correctly

2.4 Stores and transports water sample(s) appropriately until analysis

2.5 Avoids contaminating the sample(s) by washing hands and by following other recommended procedures/ protocols

3. Measures free chlorine residuals in the drinking water (Regions may have specific outcomes such as total chlorine)

3.1 Operates equipment according to manufacturer instructions

3.2 Tests the chlorine level in the community drinking water

3.3 Effectively uses the low and high modes for the chlorine test kit

3.4 Is able to identify situations where the chlorine is too high and informs the EHO

4. Analyses the drinking water sample for total coliforms and *E. coli*.

4.1 Keeps the equipment and the work area clean

4.2 Has an understanding of appropriate water terminology

4.3 Tests the drinking water sample for total coliforms and *E. coli*.

4.4 Avoids contamination of the sample(s)

4.5 Observes proper use of protective eye wear when using the ultraviolet (UV) light, unless using a UV box

4.6 Observes proper disposal of the sample(s) after analysis, especially of sample(s) that have tested positive for total coliform and *E. coli*.

4.7 Understands the importance of correct incubation period and temperature

4.8 Observes proper storage of reagents and test bottles (temperature, humidity and expiration date)

5. Applies Quality Assurance and Quality Control techniques

5.1 Understands the importance of QA/QC

5.2 Understands the importance of not using expired reagents and knowing who to contact to obtain new supplies

6. Reports water results to the EHO and other stakeholders

6.1 Records all results on water quality data sheets as provided in Section 6.2 and/or inputs results electronically into Health Canada's computerized water database immediately

6.2 Reports positive bacteriological results to the EHO immediately

6.3 Reports unusual occurrences to the EHO immediately

6.4 Reports results to the EHO, Chief and Council and Water Treatment Plant Operator (WTPO) monthly

6.5 Communicates regularly throughout the year, as required, with Chief and Council, EHO, Health Director (HD), Nurse in Charge (NIC), Community Health Nurse (CHN), WTPO, water delivery truck operator, and Community Health Representative (CHR) to report orally on program activities (accomplishments, problems etc.)

III. Evaluation Strategies and Activities

The principle objective of the evaluation is to ensure that CBWMs have the required knowledge and experience to perform their duties safely and efficiently. The evaluation checklist for each general outcome is presented in this section.

CBWMs are to be evaluated by the EHO on an ongoing basis, with a formal evaluation once per year at a minimum. The evaluation reports are to be shared with the CBWM and Chief and Council. The EHO is to keep these reports on file and use them to provide further training to the CBWM accordingly.

CBWM Evaluation Checklist (minimum requirements)

Evaluation Criteria	Yes	No
Verifies that samples are taken according to recommended sampling locations, frequency and number	❑	❑
Washes hands (Soap and water, alcohol gel or hand wipes)	❑	❑
Checks screen on tap. If it is on, removes it.	❑	❑
Runs water for a minimum of two minutes	❑	❑
Breaks the seal and takes the cap off the water sample bottle, avoiding contamination of the bottle	❑	❑
Fills sample to the 100 ml mark from the cold water tap	❑	❑
Carefully replaces the cap on the bottle and labels the bottle with a waterproof pen	❑	❑
Relates the label on the water sample bottle to the building or house number, name of occupant, collection date, chlorine level, and water source; i.e., water treatment plant, distribution system	❑	❑
Places the water sample in cooler	❑	❑

CBWM Evaluation Checklist (minimum requirements) *(cont'd)*

Evaluation Criteria	Yes	No
If not tested immediately, places the bacteriological samples in the refrigerator at a temperature ranging from 1°C to 5°C immediately after arrival at the office	❑	❑
Tests for bacteriological parameters within 24 hours of sampling	❑	❑
Follows the sampling and testing procedures for chlorine as recommended by the manufacturer	❑	❑
Verifies that the reagent has been stored properly	❑	❑
Verifies the expiry date of the reagent and ensure that the pack is not damaged	❑	❑
Opens the snap pack by breaking it along the dotted line being careful not to touch the opening and keeping it away from the breathing zone	❑	❑
Pours the reagent into the water sample to be tested and shakes it to dissolve completely	❑	❑
Properly labels the sample	❑	❑
Pours the sample into a Quanti-Tray being careful not to contaminate the tray with hands, if sampling for the most probable number	❑	❑
Seals the tray by using the Quanti-Tray Sealer, if testing for the most probable number	❑	❑
Incubates the sample for 24 hours at 35°C +/- 0.5°C, and charts the incubation temperature daily	❑	❑
Keeps the equipment and working surface clean during the procedure	❑	❑
Identifies the water sample result as positive or negative for total coliform or *E. coli*. If the sample is yellowish after 24 hours of incubation but slightly less so than the comparator, incubates for up to an additional 4 hours	❑	❑
Disposes of the sample(s) appropriately	❑	❑
Performs QA/QC as recommended by EHO	❑	❑
Uses the appropriate terminology	❑	❑
Adequately enters the results on the required water quality monitoring forms as provided in Section 6.2 and/or inputs results electronically into the regional Health Canada computerized database where available	❑	❑
Notifies the EHO of positive results immediately for for his/her action	❑	❑
Sends a monthly report to the EHO and other stakeholders	❑	❑

Questions that the CBWM should answer correctly:

- What is the community drinking water quality sampling strategy (frequency of sampling; where water should be collected; and how many samples should be collected)?
- How can drinking water quality results become invalid? (Provide at least two reasons)
- What should you do if you believe the sample was not properly collected or stored?
- What can happen if someone drinks water contaminated with *E. coli*?
- What do you do when you have a positive sample for *E. coli* and total coliform?
- Why is chlorine put into drinking water?
- What would you do if you suspected the drinking water quality might be affected by something?
- What is Quality Assurance/Quality Control (QA/QC)?
- How does your EHO ensure QA/QC?

3.11 Suggested Training Strategies and Activities for Community-Based Water Monitors

Ideally, the evaluation of CBWMs will be done in writing and as well as in a practical setting. This section presents strategies and training activities for CBWMs for each general learning outcome as described in Section 3.10. Training strategies and activities for specific learning outcomes are identified by the appropriate reference numbers provided in Section 3.10.

1. **General learning outcome: Understands the implications of drinking water quality on public health**

   Suggested Training Strategies and Activities:

   1) Have the teacher identify the possible causes of contamination from source to tap (1.1).
   2) Have the teacher discuss with the CBWM how microbiological contaminants can affect human bodies (1.2)
   3) Discuss the potential risks that could contaminate drinking water and therefore affect public health (1.2).
   4) Discuss the roles and responsibilities of the CBWM and EHO (1.3, 1.4).

2. **General learning outcome: Collects, identifies and stores sample(s) of drinking water**

   Suggested Training Strategies and Activities:

   1) Have the teacher demonstrate the proper method of collecting, identifying and storing a water sample for bacteriological control (2.1, 2.2, 2.3).
   2) Discuss factors that could invalidate the results, both at the time of collection and when storing the sample (2.2, 2.3, 2.4, 2.5).
   3) Exercise: Have the CBWM collect, identify, and store a water sample according to the lesson just learned. The instructor must observe, comment on and question the CBWM to ensure the learning outcomes have been understood and integrated (2.1, 2.2, 2.3, 2.4, 2.5).
   4) Present and discuss the sampling strategy for the CBWM to follow on-site. (2.4)
   5) Evaluation of the CBWM and discussion with the instructor. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready and able to go on to the next task.

3. **General learning outcome: Measures free chlorine residuals in the drinking water.**

   Suggested Training Strategies and Activities:

   1) Teacher demonstrates how to test for chlorine (3.1, 3.2).

2) After the demonstration, discuss factors that could invalidate the results, both at the time of collection and when storing the sample (4.4)

3) In a lecture given by the instructor, explain public health implication of chlorine concentrations that are too low, what to do if it is discovered that there is an insufficient chlorine concentration, and why it is necessary for the CBWM to report this to the EHO and the Water Treatment Plant Operator (1.2, 1.3).

4) Discuss the factors that could account for an insufficient concentration of chlorine (1.1).

5) Exercise: The CBWM analyses the drinking water for chlorine. The instructor observes, comments on, and questions the CBWM to ensure that all the learning outcomes have been properly understood and integrated (3.1, 3.2).

6) Practical lesson on the sampling strategy: The CBWM and the instructor visit the sampling points designated by the EHO. The CBWM verifies the chlorine concentration, collects water samples, and correctly labels them (2.1, 2.2, 2.3, 2.4, 3.1). The goal of this activity is to integrate general learning outcomes 1 and 2. Take this opportunity to have a field trip to meet the operator of the water filtration plant (if one is accessible) and to visit the plant. While visiting the plant, discuss and show the CBWM the natural and human influences that have a bearing on the contamination of drinking water from the source to the tap (1.1).

7) The CBWM and the instructor then return to the class and store the samples in the refrigerator for future analysis (3.1).

8) Evaluation of the CBWM and discussion with the instructor. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready and able to go on to the next task.

4. **General learning outcome: Analyses the drinking water sample for total coliforms and *E.coli*.**

Suggested Training Strategies and Activities:

1) Teacher demonstrates the technique chosen for testing for total coliforms and *E.coli* in drinking water; for example Colilert P/A; Colilert Quanti-Tray (MPN) procedure (4.3).

2) Have a discussion after this demonstration (4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8).

3) Hold a lecture and discussion covering the results obtained (1.2).

4) Exercise: The CBWM carries out tests on the samples taken and stored in general learning outcome 3, step 7, and presents the results obtained (4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8).

5) Evaluation of the CBWM on-site and discussion with the instructor. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready to advance to the next task.

5. **General learning outcome: Applies Quality Assurance and Quality Control (QA/QC) techniques.**

   Suggested Training Strategies and Activities:

   1) The instructor presents the QA/QC program and discusses the reason for its importance. (5.1).
   2) The instructor performs a demonstration on the two methods of Quality Control (5.1, 5.2).
   3) Discussion covering the demonstration (5.1, 5.2).
   4) Reading and interpretation of the results (5.1).
   5) Exercise: The CBWM practices the two strategies of Quality Control. The instructor observes, comments on, and questions the CBWM to ensure that all learning outcomes are properly understood and integrated (5.1).
   6) Evaluation of the CBWM and discussion with the teacher. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready to advance to the next task.

6. **General learning outcome: Reports water results to the EHO and other stakeholders.**

   Suggested Training Strategies and Activities:

   1) Ask the CBWM, based on previous lessons: (a) to define positive bacteriological results (6.1), and (b) to explain what may have caused the positive bacteriological results (1.1).
   2) Hold a discussion surrounding the health risks associated with contaminated water (1.1, 1.2, 1.3).
   3) Present and discuss the Walkerton, Ontario case. (1.1, 1.2, 1.3)
   4) Exercise: The instructor describes various situations to the CBWM and asks what actions he/she would take. The instructor observes, comments on, and questions the CBWM to ensure that all learning outcomes are properly understood and integrated.
   5) Evaluation of the CBWM and discussion with the teacher. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready to advance to the next task (6.1, 6.2. 6.4).
   6) The instructor asks the CBWM what, in his/her view: (a) constitutes unusual occurrences, and (b)the origin of these occurrences (1.1, 6.2).
   7) The instructor presents the unusual occurrences reports form and completes it using a concrete example (6.2).
   8) Discussion on the reason why unusual occurrences should be reported (1.3, 6.2).
   9) Carrying out the exercise, the instructor would ask the CBWM to complete the unusual occurrences report (6.3)
   10) Instructor presents and distinguishes between unusual occurrences and circumstances requiring the Boil Water Advisory (6.2, 6.3).

11) Discussion about the communication process when issuing a Boil Water Advisory (1.1, 1.2, 1.3, 6.1, 6.2, 6.4).

12) Exercise: the instructor presents a situation and asks the CBWM to determine if this case warrants a Boil Water Advisory and what the proper procedures are following this (6.1).

13) Evaluation of the CBWM and discussion with the teacher. The results of this evaluation, combined with the observations of the instructor, determine if the CBWM is ready to advance to the next task (6.1,6.2, 6.4)

14) Presentation by the instructor on the importance of gathering, entering and conserving valid water results data. (6.1, 6.2).

15) The instructor demonstrates how to record data on the selected medium (electronic, paper, etc.,) and shows the importance of being meticulous and exact when recording or entering data (6.2).

16) Carrying out the exercise, the instructor requests that the CBWM record results from all prior exercises, for example, the results for the chlorine test and the bacteriological analysis. The instructor observes, comments on, and questions the CBWM to ensure that all learning outcomes are properly understood and integrated (6.2).

17) The instructor explains the importance of the transmission of the monthly water results report to the EHO and/or his/her designate as per protocol (6.2).

18) The instructor gives a concrete example of the steps to follow by completing the monthly report and transmitting it (via sheet form or computerized) to the EHO and stakeholders as per protocol (6.1).

19) Discussion about the human qualities (behaviour/attitudes) needed to complete the task properly.

20) Exercise: The CBWM is required to simulate a transmission of results following the proper protocol. The instructor observes, comments on, and questions the CBWM to ensure that all learning outcomes are properly understood and integrated (6.1, 6.2).

21) Evaluation of the CBWM and discussion with the instructor (6.1, 6.2).

4 Chemical Monitoring

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4.1 Developing a Community-Based Monitoring Program

Source: *National Guide to Sustainable Municipal Infrastructure, InfraGuide, Innovations and Best Practices, Potable Water, Monitoring Water Quality in the Distribution System*, Version 1.0, 2005
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When developing a monitoring program, the location at which various parameters are monitored should be based on historical data, distribution system characteristics and population or consumer distribution.

A good starting point is to evaluate the system's historical data. If there are known problem areas (e.g., many similar consumer inquiries or consistent poor water quality results) they should be monitored so that the municipality can determine the cause of the problem and implement a solution. Monitoring should continue in these areas after the solution is implemented to ensure the problem has been rectified. If there are areas where water quality has varied historically, monitor these areas to determine the reason for the variability.

Monitoring locations should include high-risk areas that have sensitive facilities, such as hospitals, due to their sensitivity to public health. Select monitoring locations by evaluating distribution system characteristics. Establish locations that have good spatial respresentation, based on distance from the treatment facility(ies) or travel time within the distribution system, population density for serviced areas, and ends of the system. High flow areas should be monitored; high flows may be due to one large consumer, or connection to an adjacent municipality. Consumption patterns driven by population distribution or the presence of a high-volume consumer will be important factors. Consider the type and condition of water mains when deciding monitoring locations as well as the presence of significant distribution infrastructure, such as reservoirs or pump stations. Include monitoring locations that cover several water ages in the system. To determine the water age for large systems, a hydraulic water model or tracer study will be necessary. For smaller systems, it may be easier to evaluate water age through a detailed review of the system. For all systems, areas with low flow or dead ends should be monitored due to the possibility of increased water age and/or poor hydraulics. Storage facilities within the distribution system should be monitored, by taking samples at locations near the inlet pipe, outlet pipe, and if possible within the storage

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facility itself. Based on volume and flow conditions of these facilities, water quality has the potential to deteriorate over time. Storage facilities are also subject to nitrification problems.

When choosing monitoring locations, consider the types of sampling equipment that can be used based on the available access, possibility of contamination, and security issues. Samples may be obtained from indoor taps, outdoor hose bibs, fire hydrants, dedicated sampling stations, directly on the water main by on-line monitors, and within storage facilities. Evaluate each location based on the potential sampling equipment, the ease or difficulty of access during normal working hours and during emergency conditions (off hours), the potential for sample contamination especially for taps, hose bibs, and hydrants, and possible site security (tampering, vandalism, staff access concerns, etc.). The retrieval of samples during various weather conditions should also be considered. Obtaining extensive monitoring data from across the system on a frequent basis allows for better investigation of problems, since the data that has been collected can confirm the areas that have no problems, and as such can limit the extent of any area that may have a water quality concern. It can also demonstrate whether any issue is very localized.

Based on the chosen monitoring frequency, the collection of water samples should be spread out in time. For example, if a parameter is monitored on a weekly basis, all the samples should not be collected in one day or on the same day each week. Samples spread over time will give a better indication of water quality variability within the system.

Compare event-driven monitoring results with routine monitoring results, to determine whether a problem exists. Event driven monitoring of water quality in the distribution system when specific events occur should include procedures based on events that will probably occur either on a regular or infrequent basis. Concentrate on probable events based on past experience, rather than imagining every possibility.

4.2 Baseline Monitoring

Purpose

The purpose of baseline monitoring is to assist First Nations communities in developing a baseline of water quality parameters for use in monitoring the quality of their drinking water.

Sampling Frequency

For any new drinking water system, the first sampling should include all parameters identified in this document.

Standard practice in the water industry is to establish a water quality baseline as soon as possible, usually by sampling twice a year for at least two years or until a trend is identified.

The time required to establish a baseline depends on the past history of the water source, its location, the treatment process, and its effectiveness.

Special consumer needs may add parameters or increase the frequency of parameters selected for monitoring. Health care facilities including hospitals, nursing homes, and dialysis facilities, as well as industrial plants may have specific water quality requirements.*

In addition, there may be site specific contaminants present in the water for which the frequency of sampling would need to be increased, for example TCE or arsenic.

Once a baseline is identified, the sampling frequency can be adjusted by the community's Environmental Health Officer (EHO).

The frequency of sampling and the need for the continued analysis of all parameters can be adjusted when a substance

- Is consistently absent;
- Is always within the latest edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ);
- Is consistently at the same concentration, as per the latest edition of the GCDWQ; and
- Would not adversely affect the operator's need for information, if removed from the test process.

At a minimum, sampling for all parameters should be done once every five years in all distribution systems and cisterns.

Sampling Site

The sample should be taken at the water treatment plant (take one sample from raw water and one from treated water), as determined by the Environmental Health Officer (EHO) in consultation with the Water Treatment Plant Operator (WTPO).

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By Whom

The EHO collects the samples, with the assistance of the WTPO, for analysis by an accredited laboratory. First Nations communities are to have access to the data collected, through their community's EHO.

Quality Assurance/Quality Control

The EHOs should have access to proficiency testing results from the laboratory to confirm that it is operating within acceptable limits as designated by the accrediting agency.

Procedures

The sampling procedures (collection, preservation, storage, and shipment) should be those recommended by the accredited laboratory that will be testing the samples.

Parameters

The following are selected parameters as per the latest edition of the *GCDWQ*.

EHOs may decide to add or remove other parameters based on their assessment of risk. This list may vary depending on whether the source is ground or surface water.

Inorganic analytes

- Alkalinity[1]
- Aluminum
- Ammonia
- Antimony
- Arsenic
- Barium
- Boron
- Cadmium
- Calcium
- Chloride
- Chromium
- Colour (true)
- Copper
- Cyanide
- Fluoride
- Hardness
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Nitrate
- Nitrilotriacetic acid
- pH
- Selenium
- Silver
- Sodium
- Sulphate
- Sulphide (as H_2S)
- Total dissolved solids

[1]Water should be sampled for this parameter when water treatment plants use aluminum-based coagulants.

- Total solids
- Turbidity
- Uranium
- Zinc

Organic analytes[1]

- Benzene
- Benzo[a]pyrene
- Carbon tetrachloride
- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- 1,2-Dichloroethane
- 2,4-Dichlorophenol
- Ethylbenzene
- Monochlorobenzene
- Pentachlorophenol
- 2,3,4,6-Tetrachlorophenol
- Toluene
- Trichloroethylene (TCE)
- 2,4,6-Trichlorophenol
- Vinyl chloride
- Xylenes (total)

[1]Sampling for many organic analytes is only necessary in groundwater supplies near suspected areas such as old dump sites, abandoned gas stations, etc.

Radiochemistry analytes

- Gross alpha
- Gross beta

For more information, please refer to Health Canada's website at **www.hc-sc.gc.ca/waterquality**. To be automatically notified of updates to the GCDWQ, please join the mailing list referred to on this website.

4.3 Routine Chemical Monitoring

Purpose

The purpose of routine chemical monitoring is to provide information on the water supply for use in monitoring drinking water quality from a public health perspective. These parameters are monitored routinely because they may change over time.

Sampling Frequency

Sampling should be taken once per year.

Sampling Site

The samples should be taken in the distribution system (five or more connections), as determined by the Environmental Health Officer (EHO), in consultation with the Water Treatment Plant Operator (WTPO). At a minimum, one sample should be taken from raw water and one sample should be taken from treated water in the distribution system.

By Whom

The EHO collects the sample for analysis by an accredited laboratory. First Nations communities are to have access to the data collected through their community's EHO.

Quality Assurance/Quality Control

The EHO should have access to proficiency testing results from the laboratory to confirm that it is operating within acceptable limits as designated by the accrediting agency.

Procedures

The sampling procedures (collection, preservation, storage, and shipment) should be those recommended by the accredited laboratory that will be testing the samples.

Parameters

The following are selected parameters as per the latest edition of the *GCDWQ*.

EHOs may decide to add/or remove other parameters based on their assessment of risk. The list may vary depending on whether the source water is ground or surface water.

Alkalinity

Aluminum[1]

Ammonia as nitrogen

Arsenic

Barium

Benzene

Boron

Cadmium

Calcium

Chloride

Chromium

Colour (true)

Copper

Corrosivity (Saturation index at 4 °C)

Cyanide

Dissolved Organic Carbon

Fluoride

Hardness
Iron
Lead
Magnesium
Manganese
Mercury
Nitrate[2]
pH
Selenium
Silver
Sodium
Sulphate
Total dissolved solids
Total solids
Turbidity
Uranium
Vinyl chloride
Zinc

All results are to be reported as "total" and in the units stated in the latest edition of the GCDWQ. For more information, please refer to Health Canada's website at **www.hc-sc.gc.ca/waterquality**. To be automatically notified of updates to the GCDWQ, please join the mailing list referred to on this website.

[1]Water should be sampled for this parameter when water treatment plants use aluminum-based coagulants.

[2]Equivalent to 10 mg/L as nitrate-nitrogen. Where nitrate and nitrite are determined separately, levels of nitrite should not exceed 3.2 mg/L.

4.4 Trihalomethanes, including Bromodichloromethane Monitoring

Purpose:

The purpose of this type of sampling is to provide information on trihalomethanes (THMs). The current guidelines for THMs include the maximum acceptable concentration (MAC) for Bromodichloromethane (BDCM).

Sampling Frequency

At a minimum, quarterly monitoring of treated water from surface and groundwater sources is recommended for both THMs and BDCM.

Sampling frequency may be increased, depending on

- Past frequency of unsatisfactory samples;
- Source water quality;
- Number of raw water sources;
- Adequacy of treatment and capacity of the treatment plant;
- Size and complexity of the distribution systems; and
- Practice of disinfection.

The suggested sampling times for THMs from surface water sources are:

- Ice cover, January-February;
- Ice cover/open water, April-May;
- Open water, July-August; and
- Open water (or) ice cover, October-November.

These dates will cover all the seasons, and it is expected that THM production will show periods of high and low concentrations.

Sampling Site

The Environmental Health Officer (EHO) will help to determine the recommended location of sampling points, in consultation with Indian and Northern Affairs Canada (INAC) and Public Works and Government Services Canada (PWGSC). THMs should be sampled at the point that reflects the maximum residence time. Sampling sites include

- Water treatment plant (treated water); and
- The point of the distribution system with the highest potential for THM formation, as determined by the EHO, in consultation with the Water Treatment Plant Operator (WTPO).

By Whom

The EHO collects the sample for analysis by an accredited laboratory. First Nations communities are to have access to the data collected, through their community's EHO.

Quality Assurance/Quality Control

The EHO should have access to proficiency testing results from the laboratory to confirm that it is operating within acceptable limits as designated by the accrediting agency.

Procedures

The sampling procedures (collection, preservation, storage, and shipment) should be those recommended by the accredited laboratory that will be testing the samples.

Maximum Acceptable Concentration

The maximum acceptable concentration for total THMs in drinking water is 0.1 mg/L (100 µg/L), expressed as a running annual average of quarterly samples. When monitoring THMs to establish potential health risks, it is recommended to take an annual average result from the same sampling point of the distribution system, ideally with the highest potential THMs level.

The maximum acceptable concentration for BDCM is 0.016 mg/L (16 µg/L). Sampling for BDCM should be done at the point in the distribution system with the highest potential THMs level.

4.5 Hydrocarbons, Sour Gas, and Hydrogen Sulphide Monitoring

For these specialty items – hydrocarbons, sour gas, and hydrogen sulphide – or any other parameter not normally monitored in a drinking water supply, the following is recommended:

- Arrange collection, preservation, storage, and shipment with the assigned contract laboratory; and
- Conduct a screening test for these parameters. (These parameters are usually added to the list of analytes when baseline monitoring is undertaken, once every five years at a minimum. If this monitoring identifies the parameter in a concentration of concern, arrange for specialized sampling and testing.)

4.6 Example of a Chain of Custody Form – Water Chemistry Sample

Chain of custody form: Water samples to be analyzed for chemical parameter	
To: Att'n: Telephone: Fax:	From: _____ First Nation Telephone: Fax:
Date and time of sample(s) collection:	Sample(s) collected by:
Date and time of sample(s) submitted:	Sample(s) submitted by:
Analyses required:	Site code:
	Sampling site: (e.g., home, school, store, clinic, pumphouse, beach, before or after filter)
	Preservation:
Date and time sample(s) received by lab:	Sample(s) received at lab by:

5 Microbiological Sample Collection and Analysis

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5.1 *E. coli* and Total Coliforms Monitoring

Purpose:

The presence of *Escherichia. coli* (*E. coli*) indicates recent faecal contamination and the possible presence of enteric pathogens that may adversely affect human health. The ability of total coliforms to indicate the presence of faecal pollution is less reliable than that of *E. coli.*; however, this group of bacteria is a good indicator of quality control.

Sampling Frequency

Distribution systems with five or more connections

For communities with up to 5000 people, a sampling frequency of once per week, with a minimum of two samples from different locations in the distribution system, is recommended.

For communities with 5000 to 90,000 people, evenly spaced weekly sampling of one sample per 1000 people per month is recommended. For example, for a community with 7000 people, seven samples per month is recommended.

The sampling frequency for *E. coli* and total coliforms is concurrent with sampling for chlorine residuals.

For further direction on developing a community-based monitoring program, refer to section 4.1.1

Cisterns

A quarterly sampling frequency is recommended for cisterns.

Sampling for cisterns that are known to be contaminated due to poor conditions of the cistern is not recommended until the repairs required to protect the stored water have been made and the cistern has been disinfected.

Community Wells

A quarterly sampling frequency is recommended for community wells[1].

Sampling Site

The sample should be taken in the distribution system, as determined by the Environmental Health Officer (EHO) in consultation with the Water Treatment Plant Operator (WTPO).

Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) should be conducted on 10% of all samples (as per the Quality Assurance plan). The EHO should have access to proficiency testing results from the laboratory to confirm that it is operating within acceptable limits as designated by the accrediting agency.

[1]**Community wells**: A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada

By Whom

The EHO and (or) Community-Based Drinking Water Quality Monitors (CBWMs) are responsible for sampling and testing for total coliforms and E. coli in the distribution system.

Maximum Acceptable Concentration

Total coliforms

No consecutive sample from the same site or no more than 10% of samples within a given sampling period should have total coliforms present. If less than 10 samples are collected, no sample should show the presence of total coliforms.

E. coli

The maximum acceptable concentration for *E. coli* is 0 CFUs/100 ml.

5.2 Procedures for Collecting and Preserving Samples for Total Coliforms and *E. coli*

Section 1: Sample Labeling

Label all bottles with the proper identification number and if sending to an accredited laboratory, complete the corresponding chain of custody form (for sample forms, see Sections 5.10 and 5.11, on pages 5.10.1 and 5.11.1), making sure to include the following information:

1. List the site of collection (i.e., occupant's-name, house number, building name, and location within building, e.g., kitchen tap).
2. Give the date and time the sample was collected.
3. Record the name of the person who collected the sample.
4. Supply the sample site code.
5. Complete the section differentiating between tap (drinking) water, raw water, and bottled water.
6. Fill in any other pertinent information requested on the appropriate chain of custody form.

Section 2: Hand washing

Hands should be washed before and after performing water analyses:

1. Turn on the water to a comfortable temperature.
2. Wet hands.
3. Apply soap to all surfaces of hands and wrists.
4. Lather hands well, using friction, for at least 10 seconds, paying close attention to fingernails and fingers.
5. Rinse hands, allowing the rinse water to flow from the wrists to fingertips.
6. Dry hands using paper towels.
7. Turn the faucet off, using paper towels, and discard the towels.

Section 3: Sample Collection

1. Use only sterile microbiological sampling containers containing sodium thiosulphate (to neutralize chlorine).

2. Keep sample containers clean and free from contamination before and after collecting the sample (containers should not be opened until step 8).
3. Remove any attachments on the faucet (aeration devices, water purification device, or screens).

4. In some circumstances, flame or disinfect the tap with alcohol or bleach (at the sampler's discretion).

5. Turn on the cold water and allow it to run in a steady stream for two minutes.

6. Lower the water flow rate before taking the sample. The flow rate should be low enough to ensure that no splashing occurs as the container is filled. Do not adjust the flow rate if you are taking samples at a location where the water runs continuously.

7. While holding the sample container at the base, remove the plastic seal around the cap before attempting to open the bottle (not all water bottles have seals).

8. Remove the cap with your free hand, taking care not to touch the edge or the bottom of the cap or the top or neck of the bottle. Use only a proper container. Do not use the bottle if the cap is loose or cracked, if the bottle contains no seal, if the seal pulls away from the cap, if the bottle appears dirty, or if there are any other conditions that place the quality of the bottle in doubt. Take care not to breathe onto or inside the cap or the water bottle.

9. Hold the cap on the outside. Do not touch the inside of the cap or bottle with your fingers. Do not set the bottle cap down.

10. Do not rinse the bottle before filling it. Position the bottle under the flowing stream of water.

11. Fill the bottle to the fill line.

12. Seal the container as soon as it is filled.
13. Turn off the water and replace any attachments that were removed.
14. Label the bottle and fill out the forms with corresponding number codes.
15. Complete the required form.
16. Proceed to Section 4 (on this page) if you are sending the sample to an accredited laboratory.
17. Proceed to Section 5.6 if you are testing the sample with the Colilert procedure or a similar procedure that has been approved by the U.S. *Environmental Protection Agency* (EPA) or recommended by Health Canada. If a community uses a portable laboratory such as Colilert, 10% of all samples should be sent to an accredited laboratory for QA/QC.

Avoid taking samples from…

- Faucets that leak around the stem;
- Faucets that are dusty, dirty or corroded;
- Swing faucets;
- Faucets that cannot deliver a smooth stream of water;
- Flexible hoses or garden hoses;
- Dripping faucets;
- Faucets connected to water softeners or other treatment devices unless specifically testing for the performance of the water softeners or other treatment devices.
- Outside hose bibs with unremovable vacuum breakers;
- Faucets with an unremovable aerator; or
- Metal fixtures with external plastic or rubber inserts.

When taking samples …

- Choose cold water faucets or supplies only;
- Choose a faucet that is not connected to the building's water softener;
- Choose a smooth-end faucet over a threaded-end one;
- Use only approved sampling container;
- Do not rinse the sampling container before filling it;
- Do not discard the sodium thiosulphate crystal or powder present inside the sampling container; and
- Do not allow the water to overflow or splash down the side of the sampling container.

Section 4: Sample Handling and Storage if Sending to an Accredited Laboratory

1. Place collect samples immediately in coolers with ice packs (not loose ice).
2. Keep the samples in the coolers during transit to the laboratory.
3. Ensure that transit time between sample collection and analysis at the laboratory does not exceed 24 hours.

4. Upon delivery to the laboratory, analyze the samples immediately or place them in the refrigerator for storage.
5. Be sure all samples are analyzed within 24 hours of sample collection.

Section 5: Spill Decontamination

Because microorganisms that grow in water samples during the testing procedures may be pathogenic, spillage occurring after incubation of any positive sample should be cleaned up and the area of the spillage decontaminated as follows:

1. Wear rubber latex gloves and protective eyewear and use a splash guard.
2. Wipe up the spill, using a cloth soaked in a commercial disinfectant, being careful not to spread the spill or cause splattering. Use additional cloths soaked in disinfectant, as needed.
3. Ensure safe disposal of any items used in decontamination.

5.3 Turbidity Monitoring

Purpose

Turbidity is a muddy or cloudy appearance caused by suspended particles in the water, such as clay, silt, fine organic and inorganic matter, soluble coloured organic compounds, plankton, and other microscopic organisms.

Control of turbidity in public drinking water supplies is important for both health and aesthetic reasons. Excessive turbidity of treated water is often associated with unacceptable tastes and odours. Turbidity can harbour free-living bacteria and protozoa. The adsorptive properties for suspended particles can also lead to a concentration of heavy-metal ions and biocides in turbid waters. Turbidity can interfere with disinfection and can lower its effectiveness. Turbidity can also lead to an increase in the formation of trihalomethanes.

Sampling Frequency

Within the water treatment plant, the Water Treatment Plant Operator (WTPO) should measure individual filter turbidity and combined filter turbidity continuously (with an on-line turbidimeter) at intervals no longer than five minutes apart.

Monitoring by an Environmental Health Officer (EHO) is as required on a site-specific basis.

For further direction on developing a community-based monitoring program, refer to section 4.1.1

Sampling Site

The samples should be taken at the water treatment plant and in the distribution system (five or more connections).

By Whom

The WTPO is responsible for monitoring turbidity at the water treatment plant and in the distribution system. Testing in the distribution system is not routinely done by EHOs and (or) Community-Based Drinking Water Quality Monitors (CBWMs). They may decide to do so, at their discretion.

Quality Assurance/Quality Control

The EHO should have access to proficiency testing results from the laboratory, to confirm that it is operating within acceptable limits as designated by the accrediting agency.

Procedures

Tests for turbidity are performed by using a turbidimeter or using procedures (collection, preservation, storage, and shipment) recommended by the accredited laboratory that will be testing the samples.

With regard to use, calibration, and maintenance of turbidimeters, follow the appropriate instructions provided with the turbidimeter.

Maximum Acceptable Concentration

Water systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet the following health-based turbidity limits, as defined for specific treatment technologies. The turbidity guideline is applied to individual filter turbidity. However, good operating practices suggest that both the individual filter turbidity and the combined filter turbidity should be continuously monitored. Where possible, filtration systems should be designed and operated to reduce turbidity levels to **as low a level as possible**, with a treated water turbidity target of less than 0.1 Nephelometric Turbidity Unit (NTU) at all times. Where this is not achievable, the treated water turbidity levels from individual filters:

- For **chemically assisted filtration**, shall be less than or equal to **0.3 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 1.0 NTU at any time.
- For **slow sand or diatomaceous earth filtration**, shall be less than or equal to **1.0 NTU** in at least 95% of the measurements made, or at least 95% of the time each calendar month, and shall not exceed 3.0 NTU at any time.
- For **membrane filtration**, shall be less than or equal to **0.1 NTU** in at least 99% of the measurements made, or at least 99% of the time each calendar month, and shall not exceed 0.3 NTU at any time. If membrane filtration is the sole treatment technology employed, some form of virus inactivation should follow the filtration process.

With respect to a distribution system, a pattern in recorded turbidity levels over time and a typical turbidity level can be established. This level should then be used as maximum value. For instance, if past recorded turbidity measurements ranged from 1 to 2 NTU, and a sudden jump in the level to 6 or 8 NTU is recorded, then the issuing a BWA should be considered. A sudden jump in the turbidity level in the distribution system can indicate bacterial regrowth in the distribution system or in house plumbing components.

It is not expected that all water supplies will be able to meet this revised turbidity guideline immediately. Therefore, supplementary treatment should be considered in the interim to ensure delivery of safe drinking water.

5.4 Chlorine Residuals Monitoring

Purpose

Treated water must be continuously disinfected to protect the community from waterborne illnesses.

Use of a disinfection residual is necessary to prevent deterioration of microbial quality of drinking water in the distribution system. Disinfection is often done by adding chlorine to the water in the water treatment plant. Chlorine content should be present throughout the distribution system.

Sampling Frequency

Monitoring should be ongoing whenever bacteriological samples are taken.

For further direction on developing a community based monitoring program, refer to section 4.1.1

Sampling Site

The samples should be taken at the water treatment plant and in the distribution system (with five or more connections).

By Whom

The Water Treatment Plant Operator (WTPO) is responsible for monitoring chlorine residuals at the water treatment plant and in the distribution system.

Testing in the distribution system is done by EHOs and (or) Community-Based Drinking Water Quality Monitors (CBWMs) and is done concurrently with bacteriological sampling.

Quality Assurance/Quality Control

The EHOs should have access to proficiency testing results from the laboratory to confirm that it is operating within acceptable limits as designated by the accrediting agency.

Procedures

Tests for chlorine are performed by using a chlorimeter or using procedures (collection, preservation, storage, and shipment) recommended by the accredited laboratory that will be testing the samples.

Required Disinfection Residual

Free and total chlorine residuals at the water treatment plant should be at the operations level that ensures adequate disinfection.

Free chlorine residuals and total chlorine residuals should be greater than 0.2 mg/L and/or 1.0 mg/L, respectively, at the end of the distribution system.

5.5 *Cryptosporidium, Giardia* and Enteric Viruses

Purpose

Cryptosporidiosis and giardiasis are parasitic protozoan diseases that strike humans, domestic animals, and wildlife. Outbreaks can range from isolated cases to epidemics.

There are 10 species of *Cryptosporidium*, but only *Cryptosporidium parvum* is thought to be zoonotic (meaning it comes from an animal but can be spread to humans). *Cryptosporidium* is an enteric coccidian protozoan. The most common sources of this pathogenic protozoan are human and animal (cow, sheep, dog and cat) faece, and faecally contaminated drinking water supplies and recreational waters. The reproductive life cycle of *Cryptosporidium* oocysts lasts between two to four days. The symptoms of cryptosporidiosis usually persist for one to two weeks and include watery diarrhea, abdominal cramps, nausea, and headaches. Oocyst excretion lasts from one to four weeks.

There are six species of *Giardia*, but only *Giardia lamblia* is thought to be zoonotic. *Giardia lamblia* is a protozoan parasite that causes giardiasis, an intestinal disease also known as beaver fever, a form of gastroenteritis. Symptoms last for as long as a month and include diarrhea, abdominal cramps, gas, malaise, and weight loss. Natural hosts include beaver, muskrat, and deer. The reproductive life cycle of *Giardia* is between three to five days. Cyst excretion can continue long after the symptoms disappear.

Enteric viruses are extremely small micro-organisms that multiply only in the gastrointestinal tract of humans and other animals. There are more than 140 enteric viruses known to infect humans, and many cannot be cultured. Enteric viruses cannot multiply in the environment, but they can survive longer in water than most intestinal bacteria and are more infectious and resistant to disinfection than most other micro-organisms. Routine water quality monitoring for *E. coli* is important. The presence of *E. coli* is an indication that enteric viruses could also be present. However, because enteric viruses are more resistant to disinfection, the absence of *E. coli* does not necessarily mean that enteric viruses are also absent. Treatment technologies and watershed or wellhead protection measures known to reduce the risk of waterborne outbreaks should be implemented and maintained if source water is subject to faecal contamination or if enteric viruses have been responsible for past waterborne outbreaks. Treatment technologies should achieve at least a 4-log reduction and/or inactivation of viruses.

Sampling Frequency

Canadian drinking water supplies are generally not routinely tested for *Cryptosporidium* or *Giardia*, and such tests are not recommended in the latest edition of the *Guidelines for Canadian Drinking Water Quality* (GCDWQ). In the absence of reliable sampling methodologies

confirming the presence and viability of cysts or oocysts in the water, sampling and testing should be initiated when recommended by the Regional Medical Officer (RMO) and/or supported by epidemiological evidence

Routine monitoring for enteric viruses remains difficult. Detection methods may be expensive and are often imprecise or lack critical quality control. As such routine water monitoring for *E.coli* provides adequate indication of microbial contamination (*Cryptosporidium*, *Giardia* and Enteric viruses) in drinking water.

Maximum Acceptable Concentrations

At present, it is not possible to establish a maximum acceptable concentration (MAC) for *Cryptosporidium*, *Giardia* and Enteric Viruses as per the latest edition of the *GCDWQ*.

Until more reliable sampling methods are available, measures should be taken to reduce the risk of illness as much as possible. This can be achieved by implementing proper multi-barrier water treatment and watershed or wellhead protection strategies.

5.6 Testing Procedures for the Colilert System

Colilert is one of many systems available, and it is approved by the U.S. Environmental Protection Agency. The Colilert System is one of many systems developed and approved by the U.S. Environmental Protection Agency for presence/absence and most probable number (MPN) testing of total coliforms and *Escherichia. coli* (*E. coli*). Health Canada does not endorse the Colilert systems as the only system that could be used.

The Colilert reagent is used to detect the presence of both total coliforms and *E. coli*. The reagent, when metabolized by total coliforms, yields a yellow coloration; and when metabolized by *E. coli*, produces a visible bluish fluorescence if illuminated by an ultraviolet lamp in a dark place.

This presence/absence test indicates whether total coliforms or *E. coli* are present in the water sample. However, the test does not show the actual quantities of total coliforms or *E. coli*.

The MPN of coliforms can be determined by using IDEXX™ Quanti-Tray Sealer technology.

The equipment and supplies needed for testing water samples using Colilert equipment are available from:

IDEXX™ Laboratories Inc.
1 IDEXX Drive
Westbrook, Maine 04092,
U.S.A.

Tel: (207)856-0496
Toll-free 1-800-321-0207

Fax: (207) 856-0603

Note: The media (reagent powder) and sterile sample vessels have a limited shelf life, and their expiration dates should be checked regularly.

5.7 Sample Analysis if Using the Colilert Procedure

The Colilert System is one of many systems developed and approved by the U.S. Environmental Protection Agency for presence/absence and most probable number (MPN) testing of total coliforms and *Escherichia. coli* (*E. coli*). Health Canada does not endorse the Colilert systems as the only system that could be used.

Preparation

1. Check the expiry date of the Colilert reagent before using it. If it has expired, dispose of the reagent as per the section "Media and Sterile Vessel Handling and Storage" (page 5.7.7).

2. Carefully separate Colilert Snap Pack™ (IDEXX Cat. No. WP200, for 100 mL water sample) from the strip. Take care not to accidentally open the next pack. (Figures 5.1 and 5.2)

3. Tap the Colilert reagent snap pack to ensure that all the Colilert powder is in the bottom of the pack.

4. Aseptically open one pack by snapping back the top at the score line, as shown. Direct the package away from face while opening the snap pack (Figures 5.3 and 5.4).

5. Remove the cap from a 100 mL water sample collected in a sterile, disposable 120 mL vessel containing sodium thiosulphate. Hold the bottle cap as you did for sample collection. Add the contents of the pack to the sample. Replace the cap.

6. Shake vigorously by repeated inversion until the reagent is dissolved (Figure 5.5). Some particles may remain undissolved. Dissolution will continue during incubation. Then proceed to step 7 or 9.

   If testing for presence/absence: then proceed to step 9.

   If testing for mpN, then proceed to step 7.

7. Pour the sample into a Quanti-Tray™.

8. Seal the tray, using the Quanti-Tray™ Sealer.

9. Incubate the sample mixture at 35°C (±0.5°C) for 14 hours (Figure 5.6). Record incubator temperature and in and out time of sample on incubator record sheet (see page 5.7.5).

10. After 24 hours, compare each incubated sample against the colour comparator. If no yellow is observed, the test result is negative for total coliforms and *E. coli.* (Figure 5.7).

    If the sample has a yellow colour stronger than or equivalent to that of the comparator, the sample is positive for total coliforms (Figures 5.8 and 5.9).

If a sample is yellow after 24 hours of incubation, but slightly less so than the comparator, it may be incubated for up to an additional four hours (but no more than 28 hours total). If the sample is coliform **POSITIVE**, the colour will intensify. If the sample remains indeterminate, it should be considered invalid, and the site should be resampled.

If a sample is incubated for more than 28 hours, the following rules apply:

- No yellow colour is considered a valid negative test; and
- Yellow colour **should not** be considered positive. Resample the site.

11. Wear protective eye wear. Place **POSITIVE** samples 3-5 inches (about 7.6-12.7cm) in front of the ultraviolet light, making sure the light faces away from you and toward the sample container. Observe for fluorescence in a dark environment. If fluorescence is greater than or equal to fluorescence of the comparator, the sample is **POSITIVE for *E. coli*** (Figure 5.10).
12. Record the MPN, if you are using the Quanti-Trays™, on an MPN table (see page 5.7.6).

Note: The comparator shows the lowest level of yellow and fluorescence that can be considered POSITIVE. The colour of a typical positive test is much more intense than that of the comparator.

Figure 5.1

Figure 5.2

Figure 5.3

Proper handling. The fingers do not touch the dotted line on the Snap Pack.

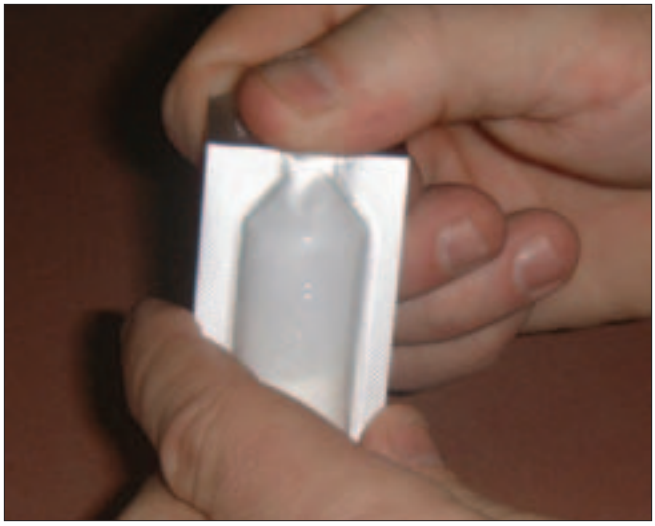


Figure 5.4

Improper handling. The fingers are touching the dotted line. There is a risk of contamination.

Figure 5.5

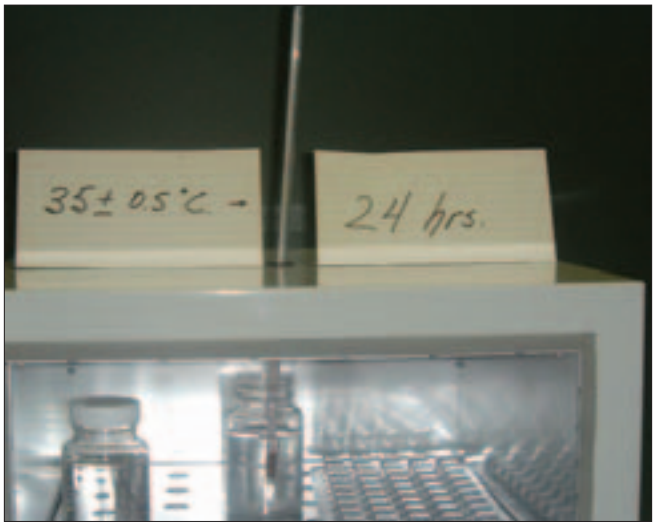


Figure 5.6

Figure 5.7

Figure 5.8

Figure 5.9

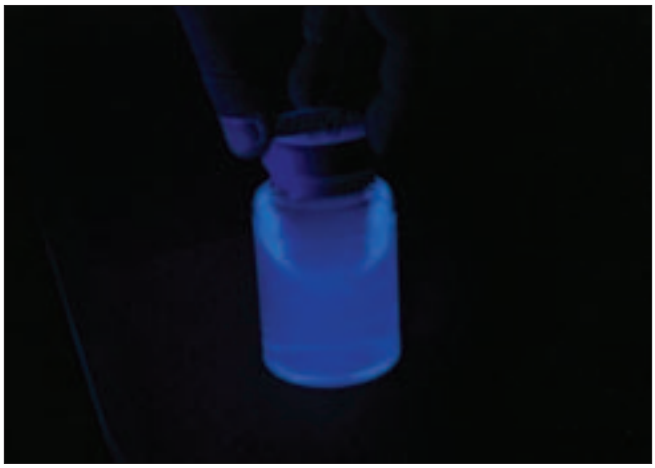


Figure 5.10

Time and Temperature Monitoring

1. Time and temperature monitoring should be performed twice per day for each day that sample analyses are being performed (incubated) or that samples are being stored (refrigerated). Temperature readings should be separated by at least four hours. Record all readings in the log below.

2. Monitor incubator temperature, using a thermometer, with the temperature-sensing portion of the thermometer immersed in a beaker of water. Store the thermometer on a shelf near the door where it is easily visible. The temperature of the incubator must be maintained at 35°C ± 0.5°C.

3. Monitor refrigeration temperatures, using a thermometer with measurements in 1°C increments. Immerse the sensing portion of the thermometer in a beaker of water. Store the thermometer on a shelf near the door where it is easily visible. Maintain the refrigerator at 1°C – 5°C.

4. The temperature in the incubator should be checked at least once a year with a thermometer, preferably a thermometer with a traceable NIST certificate.

Incubation Record Sheet

	Date	**Time**	**Incubator Temperature**
Samples in			
Temperature check		1. 2.	1. 2.
Samples out			

Well Quanti-Tray MPN Table

Number of positive wells per 100mL	Most probable number	95% confidence limits Lower	Upper	Number of positive wells per 100mL	Most probable number	95% confidence limits Lower	Upper
1	**<1**	0.0	3.7	26	**36.4**	24.7	53.9
1	**1.0**	0.3	5.6	27	**38.4**	26.4	56.6
2	**2.0**	0.6	7.3	28	**40.6**	28.0	59.5
3	**3.1**	1.1	9.0	29	**42.9**	29.7	62.5
4	**4.2**	1.7	10.7	30	**45.3**	31.5	65.6
5	**5.3**	2.3	12.3	31	**47.8**	33.4	69.0
6	**6.4**	3.0	13.9	32	**50.4**	35.4	72.5
7	**7.5**	3.7	15.5	33	**53.1**	37.5	76.2
8	**8.7**	4.5	17.1	34	**56.0**	39.7	80.1
9	**9.9**	5.3	18.8	35	**59.1**	42.0	84.4
10	**11.1**	6.1	20.5	36	**62.4**	44.6	88.8
11	**12.4**	7.0	22.1	37	**65.9**	47.2	93.7
12	**13.7**	7.9	23.9	38	**69.7**	50.0	99.0
13	**15.0**	8.8	25.7	39	**73.8**	53.1	104.8
14	**16.4**	9.8	27.5	40	**78.2**	56.4	111.2
15	**17.8**	10.8	29.4	41	**83.1**	59.9	118.3
16	**19.2**	11.9	31.3	42	**88.5**	63.9	126.2
17	**20.7**	13.0	33.3	43	**94.5**	68.2	135.4
18	**22.2**	14.1	35.2	44	**101.3**	73.1	146.0
19	**23.8**	15.3	37.3	45	**109.1**	78.6	158.7
20	**25.4**	16.5	39.4	46	**118.4**	85.0	174.5
21	**27.1**	17.7	41.6	47	**129.8**	92.7	195.0
22	**28.8**	19.0	43.9	48	**144.5**	102.3	224.1
23	**30.6**	20.4	46.3	49	**165.2**	115.2	272.2
24	**32.4**	21.8	48.7	50	**200.5**	135.8	387.6
25	**34.4**	23.3	51.2	51	**>200.5**	146.1	Infinite

Media and Sterile Vessel Handling and Storage

If you are using Colilert, the following applies to media handling and storage:

1. Use "first in-first out" storage and usage practices for all materials. Record all shipments of goods received by item and date and by container date if the date of manufacture is not present. Maintain an inventory of goods.

2. Keep Colilert media for up to one year from the date of manufacture. Discard and do not use media after one year from their date of manufacture.

3. Store Colilert media at room temperature, between 4°C and 30°C, in a dark place shielded from sunlight.

4. Keep Quanti-Cult™ media no more than one year from the date of manufacture. Discard and do not use media older than one year from their date of manufacture;

5. Refrigerate Quanti-Cult™ media between 1°C and 5°C during storage.

6. Upon receipt from the manufacturer, date sterile vessels. Discard or return unused sterile vessels after one year from their date of manufacture.

7. Store sterile sample vessels in a dry location where they will be protected from contamination.

5.8 Disposal of Contaminated Materials

Choose one of the following options when disposing of materials (Quanti-Trays™ and presence/absence 100 mL plastic containers) that contain positive samples of *E. coli* and (or) coliform bacteria.

If materials are solely for presence/absence tests

Because the sewage treatment plant is designed to handle the waste class contained in the presence/absence 100 mL test container, it is safe to dispose of liquid down the toilet. Disinfect the containers with chlorine before sending them to a sanitary landfill site.

If materials are composed of Quanti-Tray test matter, use one of the following options

1. Autoclave, using a destructive cycle.
2. Incinerate.
3. Dispose of Quanti-Tray™ with biomedical waste from the health clinic. If this is not possible, consult with the Band office in order to dispose of the Quanti-Tray™ through the Band's hazardous waste disposal system.

Note: Option 3 is recommended as it is cost effective and easy. All the health clinics and nursing stations in First Nations communities have their own Band policies and systems set up for the disposal of biomedical and hazardous waste.

Options 1 and 2 require either a portable autoclave or incinerator.

5.9 IDEXX Supplied Training Aids

IDEXX has provided the handouts in the following pages to assist Environmental Health Officers when training Community-Based Water Quality Monitors, or others who will be conducting the presence/absence or most probable number tests:

- Instructions for Colilert Quanti-Tray™ test procedure;
- General information on the IDEXX Quanti-Tray™ Sealer, including specifications, procedures, scientific basis, key benefits, and preventive maintenance instructions.

IDEXX Quanti-Tray* Sealer Model 2X User Manual

CAUTION

CAUTION: RISK OF ELECTRICAL SHOCK
Do not open the cover of this Sealer.

Do not allow water to spill into this Sealer.
Pour water samples into Quanti-Trays as described in the Quanti-Tray insert.

CAUTION: RISK OF SKIN BURNS
Your company/institution may qualify personnel for cleaning the inside of the Sealer. Qualified personnel should refer to the Preventive Maintenance Instructions for directions on how to clean the inside of the Sealer.

IDEXX Laboratories, Inc. One IDEXX Drive, Westbrook, Maine 04092 USA • Tel.: 1-207-856-0496 or 1-800-321-0207 Fax: 1-207-856-0630

www.idexx.com

Description

The IDEXX Quanti-Tray* Sealer Model 2X is a motor-driven, heated roller instrument designed to seal IDEXX Quanti-Trays (including Quanti-Tray* /2000s). This Sealer, used with Quanti-Trays and any IDEXX Defined Substrate Technology* reagent, like Colilert*, Colilert*-18, Colisure* and Enterolert*, automates the sample handling of bacterial enumeration. Together, they produce counts as accurate as membrane filtration with the ease of a presence/absence test.

Diagram 1

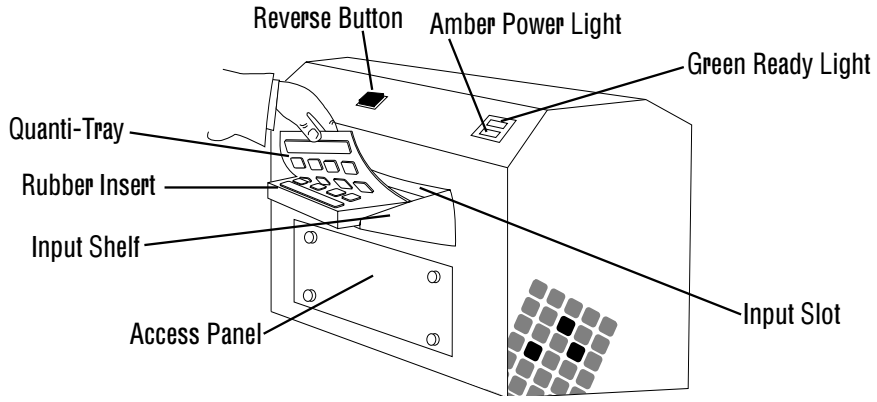
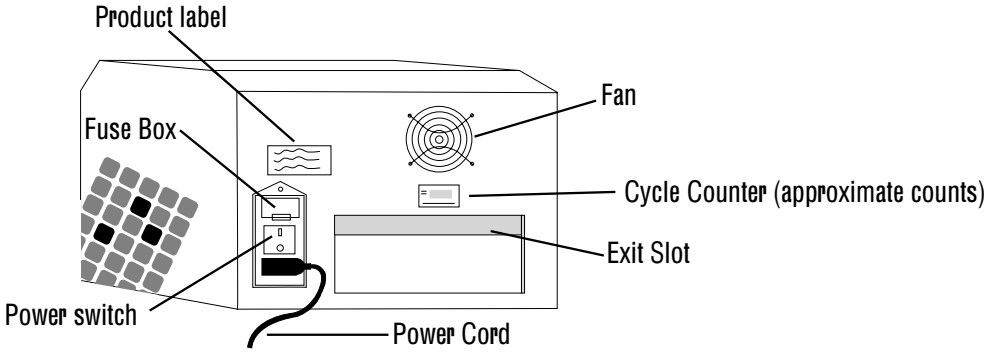


Diagram 2



Contents

Each Model 2X Sealer comes with the base Sealer unit, an input shelf, one Quanti-Tray* Rubber Insert, MPN tables, this User Manual, and Preventive Maintenance Instructions. The 115V model also comes with a standard US, 3-prong grounding power cord. The 230V model also comes with 3 cords: a UK cord, a European/Shuko cord, and a Swiss cord.
Note: Quanti-Tray/2000 Rubber Inserts (WQTSRBR-2k) are available separately. Extra Quanti-Tray Rubber Inserts (WQTSRBR-51) are also available separately.

Setting Up

- Unpack contents and save packaging for future shipping.
- Position Sealer on a level surface with adequate space for Trays to be inserted and ejected. Sealer can be used in any orientation (left-to-right or right-to-left).
- Attach Input Shelf to Sealer by inserting shelf tabs into the two slots on the front of the Sealer and clipping firmly in place.
- Ensure that Power Switch is turned off.
- Plug power cord into Sealer and then into a grounded outlet of proper voltage (see Product Label).

Operating Directions

Warning: Personal injury, Sealer damage, property damage and/or inaccurate test results may occur unless Sealer is used according to these instructions.

- Turn Power Switch on. The amber Power Light should illuminate.
- Allow the Sealer to warm up and the green Ready Light to come on (up to 10 minutes). Sealer will not operate until both the amber power light and the green Ready Light are illuminated, indicating that the unit has reached operating temperature.
- Place an empty Quanti-Tray or Quanti-Tray/2000 Rubber Insert on the Input Shelf with the large cutout facing away from the Sealer.
- Place a Quanti-Tray or Quanti-Tray/2000 filled with sample and DST* reagent onto the Rubber Insert, making sure that the Tray is properly seated in the Rubber Insert, and with each well of the Tray in its corresponding Rubber Insert hole.
- Slide the Rubber Insert with Tray into the Sealer until the motor grabs the Rubber Insert and begins to draw it into the Sealer.
- In approximately 15 seconds, the Tray will be sealed and partially ejected from the rear of the Sealer. Remove the Rubber Insert and Tray from the rear of the Sealer.
- If at any time you wish to reverse the motor drawing the Rubber Insert into the Sealer (for example, if a misaligned Tray is accidentally fed into the Sealer), press and hold the Reverse Button. However, do not reverse the motor once the Rubber Insert has been drawn fully into the Input Slot.
- Multiple Rubber Inserts can be run consecutively without pausing.
- Turn off Sealer when not in use.

Technical Specifications

Weight	Dimensions	Ambient Temperature	Power
35 lbs	12" H x 11" D x 16" W	32-90°F	115V, 60Hz, 6Amp (model 99-10893-00)
16 kg	30cm H x 27cm D x 39cm W	0-32°C	230V, 50Hz, 3Amp (model 99-10896-00)

Cleaning

The Rubber Insert may be autoclaved, or it may be cleaned with isopropyl alcohol or household bleach, taking the usual precautions when handling such liquids. Be sure to clean the rubber insert if it shows any signs of built up grime.

Clean the outside of the Sealer with a soft, dry cloth. A soft cloth moistened with water, household bleach, or isopropyl alcohol may also be used, taking the usual precautions when handling such liquids.

The Access Panel should only be opened by personnel qualified to clean the inside of the Sealer. Refer to the Preventive Maintenance Instructions for directions on how to clean the inside of the Sealer. **Cleaning should only be performed by trained personnel at your facility.** Do not open the Access Panel or tilt the Sealer if sample is dripping from the unit.

Changing Fuses

Fuses are located in the fuse holder just above the Power Switch. If it is necessary to change a fuse, turn off the Sealer and unplug the Power Cord from the Sealer before opening fuse holder. Use 6 Amp Buss MDL-6 fuses or equivalent in the 115V unit and 4 Amp Buss GDC-4 fuses or equivalent in the 230V unit.

Troubleshooting

Symptom	Recommended Action
Amber Power Light doesn't illuminate.	• Verify that the Sealer is plugged into a live outlet. • Ensure that the power switch is on. • Check fuses and replace if necessary.
Amber Power Light comes on, but the Green Ready Light takes more than 20 minutes to turn on or goes off during operation.	• Call IDEXX Technical Support or your local distributor.
Motor won't start when a Quanti-Tray is inserted.	• Be sure that Sealer has warmed up and that the green Ready Light is illuminated. • Be sure that the Quanti-Tray is face down in the Rubber Insert with the white Tray backing facing upward.
Motor starts when Quanti-Tray is inserted, but doesn't pull Tray through.	• Be sure Tray is in the Rubber Insert. • Ensure that Rubber Insert is pushed firmly into roller until motor engages it. • Clean Rubber Insert.
Quanti-Tray and Rubber Insert get stuck in Sealer.	• Press and HOLD the Reverse Button to reverse the motor until the Tray is ejected from the Input Slot. **NOTE:** If the Tray has gone all the way into the Sealer, do not use Reverse Button because the Tray may become lodged in the Sealer. Instead, pull the Rubber Insert out the Exit Slot.
Sealer makes loud hissing noise when sealing or liquid is dripping from the bottom of the Sealer.	• This is part of normal operation when trays are over filled. Do not fill Trays with more than 100ml of sample. The Sealer is designed to automatically remove excess sample from the Tray and discard it into the bottom of the Sealer.
Trays appear to have blistered, or paper backing is yellowed, after sealing.	• Call IDEXX Technical Support or your local distributor. Sealer heated roller may be running too hot.

LIMITED WARRANTY

IDEXX Laboratories, Inc. ("IDEXX") warrants this product to conform to our published specifications, when stored under appropriate conditions and given normal, proper and intended usage, until the expiration of its stated shelf life, or, if none is stated, for one year from the date of delivery of this product to the original end user purchaser ("Buyer"). IDEXX agrees during the applicable warranty period to replace all non-conforming products within 30 days after date of return to IDEXX and without cost to Buyer. IDEXX shall not have any obligation under this Limited Warranty to make replacements which result, in whole or in part, from catastrophe, fault or negligence of the Buyer, or anyone claiming through or on behalf of the Buyer, or from improper use of the products, or use of the products in a manner for which they were not designed, or by causes external to the products.

Buyer shall notify IDEXX of any products which it believes to be non-conforming during the warranty period. At IDEXX's option, such products shall be returned by Buyer, transportation and insurance prepaid, to IDEXX's designated facility for examination and testing. IDEXX shall repair or replace, within 30 days of receipt by IDEXX, any such product found to be so non-conforming and promptly return such products to Buyer, transportation and insurance prepaid. Should IDEXX's examination and testing not disclose any non-conformity covered by the foregoing warranty, IDEXX shall so advise Buyer and dispose of or return the product in accordance with Buyer's instructions and at Buyer's sole expense.

THE PROVISIONS OF THE FOREGOING LIMITED WARRANTY ARE IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL(INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). IDEXX'S LIABILITY ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLYING OFTHE PRODUCTS OR THEIR USE OR DISPOSITION, WHETHER BASED UPON WARRANTY, CONTRACT, TORT OR OTHERWISE, SHALL NOT EXCEED THE ACTUAL PURCHASE PRICE PAID BY BUYER FOR THE PRODUCTS. IN NO EVENT SHALL IDEXX BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL, INDIRECT OR EXEMPLARY DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR LOSS OF USE DAMAGES) ARISING OUT OF THE MANUFACTURE, SALE OR SUPPLY OF THE PRODUCTS. THE FOREGOING WARRANTIES EXTEND TO BUYER ONLY AND SHALL NOT BE APPLICABLE TO ANY OTHER PERSON OR ENTITY INCLUDING, WITHOUT LIMITATION, CUSTOMERS OF BUYER.

IDEXX US/Canada Technical Support
Telephone 1-800-321-0207 or 1-207-856-0496 Fax 1-207-856-0630

Manufactured under one or more of the following U.S. patents: 4,925,789; 5,429,933; 5,518,892; 5,610,029; 5,620, 865; 5,620,895; 5,753,456 and 5,780,259. Other U.S. and/or foreign patents issued or pending.
*Quanti-Tray, Defined Substrate Technology, Colilert, Colisure, Enterolert and DST are either trademarks or registered trademarks of IDEXX Laboratories, Inc. in the United States and/or other countries.

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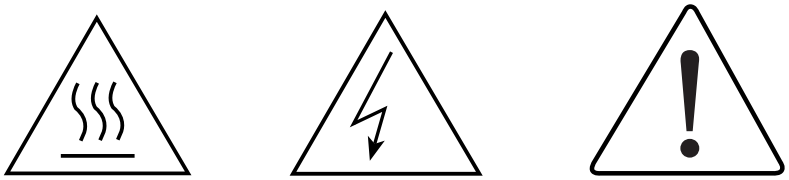
Preventive Maintenance Instructions

Quanti-Tray* Sealer Model 2X



CAUTION: BURN HAZARD

- **Cleaning should be performed by your trained personnel only**
- **Allow unit to cool at least 90 minutes before normal cleaning**
- **If hot machine must be opened, keep hands away from upper roller**

Routine maintenance or prompt cleaning after a spill will help to maintain the proper performance of the 2X sealer. Any troubleshooting or repairs other than cleaning must be referred to an IDEXX service center.

Please contact IDEXX Technical Service at 1-800-321-0207 or 1-207-856-0496 before proceeding if you have any questions.

www.idexx.com

IDEXX Laboratories, Inc.
One IDEXX Drive, Westbrook, ME 04092 USA
Tel.: 1-207-856-0496 or 1-800-321-0207
Fax: 1-207-856-0630

06-04457-01

IDEXX

The following picture outline is our recommended cleaning procedure:

1 Ensure power supply is off, sealer is unplugged and unit has completely cooled down for 90 minutes. Remove input tray shelf. Loosen four quarter-turn fasteners and remove the access panel.

2 Loosen hold-down screws, which secure the lower roller assembly to the bottom plate of the sealer.

3 Remove lower roller by lifting straight up and then out, to ensure roller clearance of locating pins on the bottom plate of the sealer.

- **Be careful not to touch the upper roller if it is hot.**

IDEXX

4 Use mild detergent, diluted bleach or isopropyl alcohol to clean all accessible surfaces inside the sealer and the lower roller assembly.

- **Never use abrasive materials for cleaning.**
- **Never use caustic cleaners.**
- **Use alcohol only on cool sealer.**
- **For stubborn deposits, allow soak time for cleaner to work.**
- **Do not disassemble lower roller assembly.**

Dry interior and roller assembly with paper towels or soft cloth.

5 Reinstall bottom roller assembly on locating pins and tighten hold-down screws.

6 Fasten access panel and reattach tray shelf.

Sealer is now ready for use.

*Quanti-Tray is either a trademark or a registered trademark of IDEXX Laboratories, Inc. in the United States and/or other countries.

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5.10 Sample of a Chain of Custody Form – Bacteriological Quality Analysis

Water samples to be analyzed for bacteriological quality	
To: Telephone: Fax:	From: _____ First Nation Telephone: Fax:
Date and Time of sample collection (mm/dd/yy):	Samples collected by
Analyses required ❑ General Bacteria (HPC), Total Coliform and Fecal Coliform ❑ Pseudomonas ❑ Aeromonas ❑ Heterotrophic Plate Count ❑ *E. Coli* ❑ Shigella ❑ Salmonella ❑ Other: _____	Sample location: (e.g., home, school, store, clinic, pumphouse, beach, before or after filter, site code) Type of System ❑ Distribution systems (more than five (5) connections) ❑ Cistern Type of disinfection (e.g., chlorine, ultraviolet, ozone, or none)
Sample Received by: _____ Dated: _____ Time: _____	

5.11 Sample of a Laboratory Requisition and Chain of Custody Form – Cyst and Botanical Detection

Laboratory requisition and chain of custody:
Cyst and botanical detection (e.g., Giardia, Crytosporidium, algae)

General information

District: HO Contact: Phone: Address: Band Contact: Phone:	
Drinking water sample information:	
Name of community:	Name of water source:
Date and Time of sample (MM/DD/YY):	Exact sampling site (site code):
Water at site sampled: ❑ Raw ❑ Treated	Chlorine contact time at sampling site: ___min Filtration Start time: _____ Stop time: _____
Ambient temperature: _____ ℃	Water meter At start time: _____ At stop time: _____ ___ m^3 or ___ Litres ___ m^3 or ___Litres
Characteristics of the water Temperature: _____ ℃ pH: _____ Turbidity: _____ NTU Free chlorine: _____ ppm	Total volume filtered water: Flow rate through filter At start time: _____ At stop time: _____ _____ Litres/min _____ Litres/min
Sample Received by: _____ Date: _____ Time: _____	

Flow rate of the source

❑ Very noticeable movement
❑ Noticeable movement
❑ Little movement
❑ No noticeable movement

Estimated flow rate: _____ m/sec

Water treatment at the consumer's tap

❑ None (raw water)
❑ Chlorine
❑ Ozone
❑ Filtration (specify type): _____
❑ Other type of treatment _____

Source water tested:

❑ Large lake
❑ Small lake
❑ Large river (> 6m across)
❑ Creek or stream (< 6m across)
❑ Spring
❑ Reservoir

Further description of source water:

General description of site:

❑ Farm/ranch land
❑ Residential
❑ Industrial
❑ Mountainous
❑ Forested
❑ Other: _____

Wild animals present in watershed:

❑ Beaver
❑ Migratory fowl
❑ Muskrat
❑ Other: _____

Farm and domestic animals present in watershed:

❑ Cattle
❑ Cats
❑ Dogs
❑ Other: _____

Animals observed in watershed:

Water system tested. Check all those that apply

❑ Distribution system (five (5) or more connections)
❑ Band operated
❑ Municipal
❑ Private utility
❑ Small system (fewer than five (5) connections)
❑ Public well (e.g., school)
❑ Other: _____

Number of people on system:

Sampling site in relation to water intake – if direct surface sample (e.g., upstream, distance away, same shore, same branch of stream)

Is water used for recreational purposes?

❑ Yes (if yes see below)
❑ No

If yes, describe activities:

❑ Hiking
❑ Boating
❑ Fishing
❑ Camping
❑ Swimming
❑ Other:

Humans in/on water source?

Humans near water source?

Additional comments:

5.12 Material Safety Data Sheet for IDEXX Reagents

Introduction:

IDEXX has provided the following material safety data sheets (MSDSs) for the reagents used in both the Colilert and Quanti-tray systems, to inform Environmental Health Officers, Community-Based Drinking Water Monitors, or others conducting the presence/absence or MPN tests about the proper first aid or spill procedures.

Note: New MSDSs must be obtained from IDEXX, at a minimum of every three years or when new MSDSs are released.

MANUFACTURER: IDEXX Laboratories Inc. Phone: (207) 856-0300

MATERIAL SAFETY DATA SHEET: COLILERT

Section 1 – Material Identification

Description: Colilert is a DST based nutrient indicator reagent for the detection of coliforms and *Escherichia coli* in water.

Section 2 – Ingredients and Hazards

N/A

Section 3 – Physical Data

Powder reagent in blister packs or tubes.

Section 4 – Fire and Explosion Data Extinguishing

Media: Use extinguishing media appropriate for the surrounding fire.

Special Fire-Fighting Procedures: Wear self-contained breathing apparatus and protective clothing to prevent contact with eyes and skin.

Section 5 – Reactivity Data

Materials in this kit are stable. Hazardous polymerization will not occur.

Section 6 – Health Hazard Information

Signs and symptoms of overexposure.

Eye contact: Unknown Skin contact: Unknown Inhalation: Unknown Ingestion: Unknown

First aid for exposure.

Eye contact: Flush thoroughly with water. Skin contact: Wash thoroughly with water. Inhalation: Remove to fresh air. Ingestion: Wash out mouth with water. Seek medical assistance.

Section 7 – Spill, Leak, and Disposal Procedures

Spill/Leak Procedures: Contain spill, then clean with copious amounts of soap and water. Avoid contact with skin or clothing. Waste Management/Disposal: Observe all Federal, State and Local laws concerning health and pollution.

Section 8 – Special Protection Information

Good housekeeping procedures and laboratory practice is the best preventative. Use in well-ventilated areas.

NOTICE: IDEXX believes the information contained herein is valid and accurate. IDEXX makes no warranty or representation as to its validity, accuracy or currency. IDEXX shall not be liable or otherwise responsible in any way for use of this information. Disposal of hazardous material may be subject to Federal, State, or local laws or regulations.

MANUFACTURER: IDEXX Laboratories Inc. Phone: (207) 856-0300

MATERIAL SAFETY DATA SHEET: QUANTI-TRAY®

Section 1 – Material Identification

Description: Quanti-Trays are sterile, disposable plastic trays designed for bacterial enumeration using Colilert®, Colilert®-18, Colisure™, and Enterolert™.

Section 2 – Ingredients and Hazards

This product contains no ingredients that are hazardous during use.

Section 3 – Physical Data

N/A

Section 4 – Fire and Explosion Data Extinguishing

Media: Use extinguishing media appropriate for the surrounding fire.

Special Fire-Fighting Procedures: Wear self-contained breathing apparatus and protective clothing. Decomposition under extreme heat conditions can release toxic gases.

Section 5 – Reactivity Data

Materials in this kit are stable.

Section 6 – Health Hazard Information

Unused trays present no hazard during normal use. Trays containing samples should be treated as biological waste. Good laboratory practice should be followed.

Section 7 – Spill, Leak, and Disposal Procedures

Spill/Leak Procedures: Contain spill from sample tray, then clean area with disinfectant cleanser. Avoid contact with skin or clothing. Should skin exposure occur, wash affected area well with cleanser intended to be used on the skin.
Waste Management/Disposal: Observe all Federal, State and Local laws concerning health and pollution. If used trays are sterilized by autoclaving, autoclave bags should be used. Autoclaving should be done in a well-ventilated area. Wet autoclaving and mechanical ventilation is preferable.

Section 8 – Special Protection Information

Good laboratory practice should be followed. To protect trays, store in a dry area away from chemical or microbiological contamination.

NOTICE: IDEXX believes the information contained herein is valid and accurate. IDEXX makes no warranty or representation as to its validity, accuracy or currency. IDEXX shall not be liable or otherwise responsible in any way for use of this information. Disposal of hazardous material may be subject to Federal, State, or local laws or regulations.

6 Test Results — Data Management, Interpretations, and Actions

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6.1 Data Management, Interpretation, and Actions

After test results are obtained from either portable laboratory water test kits or accredited laboratories, the individual who first receives the results – either the Community-Based Drinking Water Quality Monitor (CBWM) or the Environmental Health Officer (EHO) – should enter the results onto one of the water quality monitoring forms (see pages 6.2.1 – 6.2.3) or, where available, into a computerized database. Where a laboratory has direct access to a regional Health Canada computerized database, staff that have been trained and authorized by an EHO and (or) Regional Environmental Health Manager may enter results directly.

Immediately upon determining that *Escherichia coli (E. coli)*, total coliforms, and (or) turbidity exceed the maximum acceptable concentrations (MACs) detailed in the *Guidelines for Canadian Drinking Water Quality* (GCDWQ) or chlorine residuals do not meet the MAC detailed in the GCDWQ, the CBWM is to notify the EHO for interpretation of the results.

The CBWM is to provide data to the EHO for interpretation of results within a week if a microbacteriological parameter exceeds the MAC or the interim maximum allowable concentration (IMAC), as per the latest edition of the GCDWQ.

The CBWM and the EHO are responsible for maintaining copies of all data. Once a month, the CBWM is to provide a copy of the data sheets (see pages 6.2.1 – 6.2.3) to Chief and Council, the Water Treatment Plant Operator, and the EHO. These records, at a minimum, must be retained for two years.

The EHO is to then notify the following individuals of the interpretation of the results:

- Chief and Council;
- Regional Medical Officer (RMO);
- Health Director;
- Nurse in Charge;
- Community Health Nurse (CHN);
- Community Health Representative (CHR);
- Water Treatment Plant Operator (WTPO);
- Community-Based Drinking Water Quality Monitor (CBWM);
- Regional Environmental Health Manager (REHM); and
- Indian and Northern Affairs Canada (INAC) representative.

In some circumstances, an EHO may recommend that Chief and Council issue a Boil Water Advisory and take the necessary corrective actions.

In some circumstances, a RMO who is designated authority under the appropriate provincial *Public Health Act* may issue a Boil Water Order.

Chief and Council are the primary authority responsible for taking action if a threat to the health and safety of the community is identified. Therefore, the EHO must provide Chief and Council with the interpretation of drinking water sample results for their action.

The EHO and other stakeholders are available to Chief and Council for advice, assistance, and recommendations.

6.2 Water Quality Monitoring Forms and Reports

Community name: _____

Sampled by: _____

Date and Time	**Sample Number**	**Sample** (include site code, house and building number)	**Result**		**Satisfactory (yes/no) to be completed by EHO**
			Total coliforms (MPN or P/A)	***E. coli*** **(MPN or P/A)**	

Sample of a Water Quality Monitoring Form for Use by EHO and (or) CBWM

Community name: _____

Sampled by: _____

Quality control		
Date	**Agent**	**Color**
	E. coli	_____ / _____
	K. pneumoniae	_____ / _____
	P. aeruginosa	_____ / _____

Microbiological analysis					
Date and Time	**Sample Number**	**Sample** (include site code, house and building number)	**Result**		**Satisfactory (yes/no) to be completed by EHO**
			Total coliforms (MPN or P/A)	***E. coli*** **(MPN or P/A)**	

Bacteriological Water Quality Summary Report

Water Quality Testing for (Community Name): _____

Submitted by: _____ Date (Month/Year): _____

Home Owner or Facility	Sample Collection Site	Date & Time of Sample	Incubation (from __ to __)		Colilert Lab Results		Source of Water: (distribution system, cistern, etc.)	Water Treatment		Satisfactory (yes/no) to be completed by EHO
			Date/ Time (from)	Date/ Time (to)	Total coliform MPN/100ml or P/A	*E. coli* MPN/100ml or P/A		YES	NO	

EXAMPLES OF REPORTING TESTING RESULTS

Health Centre	Staff Lunch room sink	3/4/01, 11:00 am	3/4/01, 2:00 pm	4/4/01, 2:00 pm	0	0	Piped			none
Bob Willingdon's House	Kitchen Sink	3/4/01, 11:45 am	3/4/01, 2:00 pm	4/4/01, 2:00 pm	2	0	Piped			none
Water Delivery Truck	Fill Hose	3/4/01, 1:00pm	3/4/01, 2:00 pm	4/4/01, 2:00 pm	4	1	WTP			Fill Hose dirty
Rose Jones' Trailer	Washroom Sink	3/4/01, 1:30 pm	3/4/01, 2:00 pm	4/4/01, 2:00 pm	10	3	Cistern			Cover Broken

6.3 Procedures for Issuing a Water Quality Report

Purpose

A water quality report is developed and issued to provide a summary of water quality issues that may have been discovered during monitoring, as well as those actions taken or proposed for ameliorating any unsatisfactory parameters.

Communication Process

Stakeholders (e.g., EHO, INAC representative), individually or collectively, may provide Chief and Council with a water quality report, either orally or in writing, depending on the situation. If required, a stakeholder may recommend corrective actions.

If a stakeholder produces a water quality report, he or she is to provide a copy to Chief and Council, the EHO, the RMO, the Health Director, the Nurse in Charge, the Community Health Nurses (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitors (CBWM), the Water Treatment Plant Operator (WTPO), the Regional Environmental Health Manager (REHM), and the Indian and Northern Affairs Canada (INAC) representative.

Response Process

Chief and Council are responsible for taking the necessary corrective actions. This includes notifying their employees, both orally and in writing, to take the necessary corrective actions. The EHO and other stakeholders are available to provide Chief and Council with advice, assistance, and recommendations.

Circumstances Requiring a Water Quality Report

- A water quality report is requried if free chlorine residuals and total chlorine at the water treatment plant are below the operations levels that ensure adequate disinfection but can be corrected in a timely manner;
- At the end of distribution system, free chlorine residuals are at less than 0.2 mg/L or combined chlorine is at less than 1.0 mg/L but can be raised to 0.2 and 1.0 mg/L, respectively, in a timely manner;
- The treated turbidity levels recorded by the Water Treatment Plant Operator from individual or combined filters at any time is more than:
  - 1.0 Nephelometric Turbidity Unit (NTU) if water is treated by a chemically assisted filtration system
  - 3.0 NTU if water is treated by slow sand or diatomaceous earth filtration;
  - 0.3 NTU if water is treated by a membrane filtration system
- A turbidity level in the distribution system shows sudden increases above a normal baseline level;

- A sample shows the presence of *E. coli*;
- Coliform bacteria is present in a distribution system where fewer than 10 samples are collected in a given specific period and the situation cannot be corrected in a timely manner;
- More than 10% of samples or consecutive samples from the same site show the presence of total coliform bacteria, in a distribution system when more than 10 samples are collected in a given sampling period and the situation cannot be corrected in a timely manner;
- Bacteriological results have been interpreted by the EHO;
- Routine and baseline chemical results have been interpreted by the EHO; or
- There is an indication that adverse water is entering into the distribution system but the situation can be corrected in a timely manner.

It is recommended that in any of the circumstances detailed above, activities be supported by follow-up sampling.

With respect to a distribution system, a pattern in recorded turbidity levels over time and a typical turbidity level can be established. This level should then be used as maximum value. For instance, if past recorded turbidity measurements ranged from 1 to 2 NTU, and a sudden jump in the level to 6 or 8 NTU is recorded, then the issuing a BWA should be considered. A sudden jump in the turbidity level in the distribution system can indicate bacterial regrowth in the distribution system or plumbing.

Water Quality Report

Community name: _____

Description of circumstance: _____

_____

_____

Action taken to date: _____

_____

_____

Further action proposed: _____

_____

_____

Other agencies involved: _____

_____

_____

Implications: _____

_____

_____

_____

_____

_____

Prepared by: _____ Approved by: _____

Date: _____ Date: _____

6.4 Drinking Water Advisories

Guidance for Issuing and Lifting Drinking Water Advisories

Drinking Water Advisories (DWA) is a blanket term to cover the following types of advisories to the public: Drinking Water Avoidance Advisories (Do Not Consume and Do Not Use) and Boil Water Advisories/Boil Water Orders (BWA/BWO).

The purpose of this section is to help water purveyors and health and environment authorities determine which factors must be considered before a DWA is issued or lifted. A DWA is issued when the quality and (or) safety of water in the distribution system can no longer be guaranteed or when epidemiological evidence indicates that the drinking water is or may be responsible for an outbreak of waterborne disease.

The prevailing factors determining the issuance of a DWA are the severity of the problem and how quickly it can be resolved. DWAs are administrative actions used to alert the community that the water in their distribution system may be unsafe and that a proper course of action should be taken (boil water, use alternate safe source). The decision to issue a Boil Water Advisory is made at the local level, based on site-specific knowledge and problems with the quality of water. A Boil Water Order is issued by a Regional Medical Officer (RMO) under the authority of a provincial *Public Health Act*. The criteria for a Boil Water Order are much the same as for a Boil Water Advisory but differ in the severity health impacts.

Bringing water to a rolling boil for at least one minute will inactivate all waterborne pathogenic microorganisms, rendering the water potable. It is important to note that this method will not eliminate all contaminants from the water. For example, boiling does not destroy heat-stable cyanobacterial toxins or disinfection by-products (even though some may evaporate).

The most common reason for issuing a DWA is the presence of an unacceptable level of bacteria or a contaminant in the drinking water. In some jurisdictions, advisories are issued exclusively on the confirmed presence of an unacceptable level of total coliforms or heterotrophic plate counts. In others jurisdictions, advisories are only issued in response to the confirmed presence of *E. coli* or thermo-tolerant coliforms. An excess of total coliforms or heterotrophic bacteria in the distribution system but not in the water leaving the treatment plant usually indicates bacterial regrowth in the distribution system. Because total coliform and heterotrophic bacteria are normally found in nature, their presence in the distribution system does not necessarily indicate a health risk. However, if remedial measures (e.g., flushing the water mains and increasing the chlorine level) do not correct this problem, the Environmental Health Officer (EHO) may advise Chief and Council to issue a Boil Water Advisory or the RMO (if designated the authority under the appropriate provincial *Public Health Act*) may issue a Boil Water Order. Conversely, if the presence of *E. coli* is confirmed, clearly indicating microbiological

contamination from human or animal faeces, the EHO should advise Chief and Council to issue a Boil Water Advisory immediately, or the RMO (if designated the authority under the appropriate provincial *Public Health Act*) should issue a Boil Water Order immediately.

Some authorities prefer to use the confirmed presence of thermo-tolerant coliforms (faecal coliforms) as the trigger for issuing a Boil Water Advisory. However, as some species in this group (e.g., Klebsiella pneumoniae) occur naturally in vegetation and soils, as well as in faeces, their presence alone is not absolute proof of faecal contamination. When thermo-tolerant coliforms are detected, they should be correctly identified before any action is taken.

If *E. coli* is found, a Boil Water Advisory or a Boil Water Order must be issued immediately.

The mere presence of parasitic cysts or oocysts in treated drinking water is not, in itself, sufficient justification for issuing a Boil Water Advisory. Today's testing methods simply show the presence of cysts or oocysts but not their viability, and thus their potential for causing illness. Nevertheless, the presence of cysts or oocysts in treated drinking water could be a sign of inadequate treatment or lack of treatment.

Certain parasitic illnesses, such as cryptosporidiosis, may pose a greater health threat to people with weakened immune systems. People with weakened or compromised immune systems should consult their physicians to determine the risks and remedial measures available to them. In these cases, the CHN, in conjunction with the Community Health Representative (CHR), should promptly monitor the community for trends that may indicate a waterborne disease outbreak and notify the RMO.

When a DWA is issued, the community also needs to be alerted to the risk of scalding (from spilt or splashed boiling water). Young children, pregnant women and the elderly are at the most risk.

DWAs are lifted when two consecutive sets of samples indicate the quality of treated water is acceptable. This is likely to occur when the malfunction of a treatment system has been corrected. In the case of a waterborne illness outbreak, advisories are usually rescinded after the above conditions have been met and when surveillance indicates that the incidence of the illness in the community has returned to background levels.

The Chief and Council are responsible for lifting a Boil Water Advisory. Boil Water Orders, on the other hand, originate from a different operational structure, that of the RMO. The RMO, in consultation with Chief and Council, the EHO, the Nurse in Charge, the Water Treatment Plant Operator and the Community-Based Drinking Water Quality Monitor, will lift a Boil Water Order. Chief and Council are then responsible for communicating the lifting of a Boil Water Order.

6.5 Procedures for Issuing Boil Water Advisories

Purpose

The purpose of this section is to help Community-Based Drinking Water Quality Monitors, and health and environment authorities determine which factors must be considered before a Boil Water Advisory is issued. The decision to issue a Boil Water Advisory must be based on site-specific knowledge and conditions. The most common reason for issuing a Boil Water Advisory is an unacceptable level of bacteria in the drinking water.

Authority to Issue a Boil Water Advisory

The Environmental Health Officer (EHO) recommends to Chief and Council that they issue a Boil Water Advisory and, if required, recommends the necessary corrective action(s). Chief and Council are responsible for issuing a Boil Water Advisory.

Communication Process

The EHO is responsible for recommending, orally and in writing, to Chief and Council, the Regional Medical Officer (RMO), the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitor (CBWM), the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), the Indian and Northern Affairs Canada (INAC) representative, and any other appropriate stakeholders that a Boil Water Advisory should be issued and that corrective actions be undertaken, if required.

Chief and Council are responsible for issuing a Boil Water Advisory, orally and in writing, to all users of the drinking water, government health officials, elected officials, the media, and the general public, as per the Emergency Response Plan.

Chief and Council are responsible for notifying, orally and in writing, the EHO, the RMO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other appropriate stakeholder that they have issued a Boil Water Advisory.

Response Process

Chief and Council are responsible for implementing the recommendations to rectify the problem that led to the issuance of the Boil Water Advisory. This includes notifying their employee(s), both orally and in writing, to take the necessary corrective actions.

The EHO and other stakeholders are available to provide Chief and Council with advice, assistance, and recommendations.

Circumstances Where Issuing a Boil Water Advisory Should be Considered

In most cases, Boil Water Advisories are issued if:

- Free chlorine residuals and total chlorine at the water treatment plant are below the operation levels that ensure adequate disinfection and the situation cannot be corrected in a timely manner;
- At the end of distribution system, free chlorine residuals are at less than 0.2 mg/L or combined chlorine is at less than 1.0 mg/L and they cannot be raised to 0.2 and 1.0 mg/L, respectively, in a timely manner;
- **The treated water turbidity levels, recorded by the Water Treatment Plant Operator, from individual or combined filters at any time exceeds:**
  - 1.0 Nephelometric Turbidity Unit (NTU) if water is treated by a chemically assisted filtration system;
  - 3.0 NTU if water is treated by slow sand or diatomaceous earth filtration;
  - 0.3 NTU if water is treated by a membrane filtration system.

  With respect to a distribution system, a pattern in recorded turbidity levels over time and a typical turbidity level can be established. This level should then be used as maximum value. For instance, if past recorded turbidity measurements ranged from 1 to 2 NTU, and a sudden jump in the level to 6 or 8 NTU is recorded, then the issuing a BWA should be considered. A sudden jump in the turbidity level in the distribution system can indicate bacterial regrowth in the distribution system or in house plumbing components.
- A sample shows the presence of *E. coli*;
- Coliform bacteria is present in a distribution system where fewer than 10 samples are collected in a given specific period and the situation cannot be corrected in a timely manner;
- More than 10% of samples or consecutive samples from the same site show the presence of total coliform bacteria, in a distribution system where more than 10 samples are collected in a given sampling period and the situation cannot be corrected in a timely manner
- There is an indication that adverse water is entering the distribution system and the situation cannot be corrected in a timely manner, as in the case of
  - Significant deterioration in source water quality,
  - Equipment malfunction during treatment or distribution,
  - Situations in which the operation of the system would compromise public health,
- Epidemiological evidence indicates that the drinking water may be responsible, or is responsible, for an outbreak of waterborne disease.

It is recommended that in any of the circumstances detailed above, activities be supported by follow-up sampling.

6.6 Procedures for Lifting Boil Water Advisories

Authority to Lift a Boil Water Advisory

The Environmental Health Officer (EHO) recommends to Chief and Council that a Boil Water Advisory be lifted.

Chief and Council are responsible for lifting a Boil Water Advisory.

Communication Process

The EHO is responsible for recommending, orally and in writing, to Chief and Council, the Regional Medical Officer (RMO), the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitor (CBWM), the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), the Indian and Northern Affairs Canada (INAC) representative, and any other appropriate stakeholders that a Boil Water Advisory be lifted.

Chief and Council are responsible for lifting a Boil Water Advisory and advising all users of the drinking water, government health officials, elected officials, the media, and the general public, orally and in writing, as per the Emergency Response Plan.

Chief and Council are responsible for notifying, orally and in writing, the EHO, the RMO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other appropriate stakeholders that they have lifted a Boil Water Advisory.

Circumstances Where Lifting a Boil Water Advisory Should be Considered

In most cases, Boil Water Advisories are lifted if:

- Free chlorine residuals and total chlorine at the water treatment plant have been raised to the operations level that ensures adequate disinfection;
- At the end of distribution system, free chlorine residuals are greater than or equal to 0.2 mg/L or combined chlorine is greater than or equal to 1.0 mg/L;
- The treated water turbidity levels, recorded by the Water Treatment Plant Operator, from individual or combined filters at any time does not exceed:
  - 1.0 Nephelometric Turbidity Unit (NTU) if water is treated by a chemically assisted filtration system;
  - 3.0 NTU if water is treated by slow sand or diatomaceous earth filtration;
  - 0.3 NTU if water is treated by a membrane filtration system.

- Two consecutive samples taken 24 hours apart at the same site verify that
  - *E. coli* are no longer found in the water leaving the treatment plant or in the distribution system, and this is confirmed with follow-up sampling; and
  - Total coliform bacteria are not present;
- Less than 10% of samples from the distribution system in a given sampling period show the presence of total coliform bacteria;
- The situation allowing adverse water to enter the distribution system has been corrected; and
- Epidemiological evidence indicates that the drinking water was not responsible, or is no longer responsible, for an outbreak of waterborne disease.
- When recorded turbidity levels return to normal reading.

6.7 Procedures for Issuing a Boil Water Order

Purpose

The purpose of this section is to inform Community-Based Drinking Water Quality Monitors (CBWMs) and health and environment authorities of factors which contributed to the Regional Medical Officer's (RMO's) determination to issue a Boil Water Order, in consultation with Chief and Council, the Environmental Health Officer (EHO), the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the CBWM, the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), and any other appropriate stakeholders. The decision to issue a Boil Water Order is based on site-specific knowledge and conditions. The most common reason for issuing a Boil Water Order is unacceptable levels of bacteria in the drinking water.

Authority to Issue a Boil Water Order

The RMO has the authority to issue a Boil Water Order, where the RMO is designated as having this authority under the appropriate provincial *Public Health Act*.

Communication Process

The RMO issues a Boil Water Order in consultation with Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the WTPO, and any other appropriate stakeholders.

The RMO will advise, both orally and in writing, Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other stakeholders that they have issued a Boil Water Order.

Chief and Council are responsible for notifying all users of the issuing of the Boil Water Order, government health officials, elected officials, the media, and the general public, orally and in writing as per the Emergency Response Plan.

Response Process

Chief and Council are responsible for taking the necessary corrective actions. This includes notifying their employees (e.g. the WTPO), both orally and in writing, to take the necessary corrective actions.

The EHO and other stakeholders are available to provide Chief and Council with advice, assistance, and recommendations.

Circumstances Where Issuing a Boil Water Order Should be Considered

In most cases, Boil Water Orders are issued if:

- Free chlorine residuals and total chlorine at the water treatment plant are below the operations levels that ensure adequate disinfection and cannot be corrected in a timely manner;

[1] Refer to Chapter 9 for alternatives to boiling water.

- At the end of distribution system, free chlorine residuals are at less than 0.2 mg/L or combined chlorine is at less than 1.0 mg/L and cannot be raised to 0.2 and 1.0 mg/L, respectively, in a timely manner;
- The treated water turbidity levels, recorded by the Water Treatment Plant Operator, from individual filters at any time exceeds:
  - 1.0 Nephelometric Turbidity Unit (NTU) if water is treated by a chemically assisted filtration system;
  - 3.0 NTU if water is treated by slow sand or diatomaceous earth filtration;
  - 0.3 NTU if water is treated by a membrane filtration system.

  With respect to a distribution system, a pattern in recorded turbidity levels over time and a typical turbidity level can be established. This level should then be used as maximum value. For instance, if past recorded turbidity measurements ranged from 1 to 2 NTU, and a sudden jump in the level to 6 or 8 NTU is recorded, then the issuing a BWA should be considered. A sudden jump in the turbidity level in the distribution system can indicate bacterial regrowth in the distribution system or in house plumbing components.
- A sample shows the presence of *E. coli*;
- Coliform bacteria is present in a distribution system where fewer than 10 samples are collected in a given specific period and the situation cannot be corrected in a timely manner;
- More than 10% of samples or consecutive samples from the same site show the presence of total coliform bacteria, in a distribution system where more than 10 samples are collected in a given sampling period and the situation cannot be corrected in a timely manner;
- There is an indication that adverse water is entering the distribution system and the situation cannot be corrected in a timely manner, as in the case of:
  - Significant deterioration in source water quality,
  - Equipment malfunction during treatment or distribution, or
  - Situations in which the operation of the system would compromise public health;
- Epidemiological evidence indicates that the drinking water may be responsible, or is responsible, for an outbreak of waterborne disease.

  It is recommended that in any of the circumstances detailed above, activities be supported by follow-up sampling.

6.8 Procedures for Lifting a Boil Water Order

Authority to Lift a Boil Water Order

The Regional Medical Officer (RMO) has the authority to lift a Boil Water Order, where the RMO is designated this authority under the appropriate *Public Health Act*.

Communication Process

The RMO lifts a Boil Water Order in consultation with Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the WTPO, and any other appropriate stakeholders.

The RMO will advise, both orally and in writing, Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the Regional Environmental Health Manager (REHM), the WTPO, the Indian and Northern Affairs Canada (INAC) representative, and any other appropriate stakeholders that the Boil Water Order has been lifted.

Chief and Council are responsible for notifying all users of the lifting of the Boil Water Order, government health officials, elected officials, the media, and the general public orally and in writing, as per the Emergency Response Plan.

Circumstances Where Lifting a Boil Water Order Should be Considered

In most cases, Boil Water Orders are lifted if:

- Free chlorine residuals and total chlorine at the water treatment plant have been raised to the operations levels that ensure adequate disinfection;
- At the end of the distribution system, free chlorine residuals are at greater than or equal to 0.2 mg/L or combined chlorine is at greater than or equal to 1.0 mg/L;
- The treated water turbidity levels, recorded by the Water Treatment Plant Operator, from individual or combined filters at any time does not exceed:
  - 1.0 Nephelometric Turbidity Unit (NTU) if water is treated by a chemically assisted filtration system;
  - 3.0 NTU if water is treated by slow sand or diatomaceous earth filtration;
  - 0.3 NTU if water is treated by a membrane filtration system.
- Two consecutive samples taken 24 hours apart at the same site verify that
  - *E. coli* are no longer found in the water leaving the treatment plant or in the distribution system, and this is confirmed with follow-up sampling, and
  - Total coliform bacteria are not present;

- Less than 10% of samples from the distribution system in a given sampling period show the presence of total coliform bacteria;
- The situation allowing adverse water to enter the distribution system has been corrected; and
- Epidemiological evidence indicates that the drinking water was not responsible, or is no longer responsible, for an outbreak of waterborne disease.
- When recorded turbidity levels return to normal reading.

6.9 Procedures for Issuing Do Not Consume and Do Not Use Advisories/Orders

Purpose

The purpose of this section is to help Environmental Health Officers (EHOs) and health and environment authorities determine which factors must be considered before a Do Not Consume or a Do Not Use Advisory/Order is issued. The decision to issue a Do Not Consume or a Do Not Use Advisory/Order is based on site-specific knowledge and water conditions.

Authority to Issue a Do Not Consume or a Do Not Use Advisory/Order

The EHO or the Regional Medical Officer (RMO) recommend to Chief and Council that they issue a Do Not Consume or a Do Not Use Advisory (DNCA/DNUA) and, if required, recommends the necessary corrective action(s). Chief and Council are responsible for issuing a DNCA or a DNUA.

The RMO has the authority to issue a Do Not Consume or a Do Not Use Order (DNCO/DNUO), where the RMO is designated as having this authority under the appropriate provincial *Public Health Act*.

Communication Process

Advisories:

The EHO or the RMO is responsible for recommending orally and in writing to Chief and Council, the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitor (CBWM), the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), the Indian and Northern Affairs Canada (INAC) representative, and any other appropriate stakeholders that a DNCA or a DNUA should be issued and that corrective actions be undertaken, if required.

Chief and Council are responsible for issuing a DNCA or DNUA, orally and in writing, to all users of the drinking water, government health officials, elected officials, the media, and the general public, as per the Emergency Response Plan.

Chief and Council are responsible for notifying, orally and in writing, the EHO, the RMO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other appropriate stakeholder that they have issued a DNCA or DNUA.

Orders:

The RMO issues the DNCO or DNUO in consultation with the Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO and any other appropriate stakeholders.

The RMO will notify, both orally and in writing, Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other stakeholders that they have issued a DNCO or DNUO.

Chief and Council are responsible for notifying, orally and in writing, all users of the drinking water, government health officials, elected officials, the media, and the general public, of the issuing of the DNCO or DNUO, as per the Emergency Response Plan.

Response Process

Chief and Council are responsible for taking the necessary corrective actions. This includes notifying their employee(s), both orally and in writing, to take the necessary corrective actions.

The EHO and other stakeholders are available to provide Chief and Council with advice, assistance, and recommendations.

Circumstances Requiring a Do Not Consume or a Do Not Use Advisory/Order

A DNCA/DNCO is issued to the public when the water in a community's water system contains a contaminant (usually a chemical or a radionuclide) that poses a health risk, and cannot be removed from the water by boiling.

A DNUA/DNUO is issued to the public when the water in a community's water system contains a contaminant that poses a health risk and cannot be removed from the water by boiling and exposure to the water could cause skin and/or eye and/or nose irritation. A Do Not Use Advisory/Order is also issued when an unknown contaminant has contaminated the drinking water supply (e.g. a chemical spill).

6.10 Procedures for Lifting Do Not Consume and Do Not Use Advisories/Orders

Authority to Lift a Do Not Consume or a Do Not Use Advisory/Order

The Environmental Health Officer (EHO) or the Regional Medical Officer (RMO) recommend to Chief and Council that a Do Not Consume or a Do Not Use Advisory (DNCA/DNUA) be lifted.

Chief and Council are responsible for lifting a DNCA or DNUA.

The RMO has the authority to lift a Do Not Consume or a Do Not Use Order (DNCO/DNUO) where the RMO is designated as having this authority under the appropriate provincial *Public Health Act*.

Communication Process

Advisories:

The EHO or RMO is responsible for recommending orally and in writing to Chief and Council, the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitor (CBWM), the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), the Indian and Northern Affairs Canada (INAC) representative, and any other appropriate stakeholders that a DNCA/DNUA be lifted.

Chief and Council are responsible for lifting a DNCA/DNUA and advising all users of the drinking water, government health officials, elected officials, the media, and the general public, orally and in writing, as per the Emergency Response Plan.

Chief and Council are responsible for notifying, orally and in writing, the EHO, the RMO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other appropriate stakeholder that they have lifted a DNCA/DNUA.

Orders:

The RMO lifts the DNCO or the DNUO in consultation with the Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the WTPO and any other appropriate stakeholders.

The RMO will advice Chief and Council, the EHO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the Indian and Northern Affairs representative, and any other appropriate stakeholders, both orally and in writing, that the DNCO or DNUO has been lifted.

Chief and Council are responsible for notifying all users of the drinking water, the government health officials, elected officials, the media, and the general public, orally and in writing, that the a DNCO or DNUO has been lifted.

Circumstances Requiring a Do Not Consume or a Do Not Use Advisory/Order Be Lifted

Do Not Consume or Do Not Use Advisories/ Orders are lifted when the contamination of the drinking water no longer poses a significant risk to public health.

6.11 Unusual Occurrences

Purpose

An Unusual Occurrence Report (UOR) is developed and issued to provide the Chief and Council, the Environmental Health Officer (EHO), the Regional Medical Officer (RMO), the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Community-Based Drinking Water Quality Monitor (CBWM), the Regional Environmental Health Manager (REHM), the Water Treatment Plant Operator (WTPO), the INAC representative, and any other appropriate stakeholders with a summary of water quality issues that may arise or have been brought about by the unusual occurrence, as well as those actions taken or proposed to ameliorate the situation and any potential deleterious effects.

Communication Process

Stakeholders, individually or collectively, may provide Chief and Council with an Unusual Occurrence Report, either orally or in writing, depending on the situation. If required, stakeholders may recommend corrective action(s).

A stakeholder producing an Unusual Occurrence Report is to provide a copy to Chief and Council, the EHO, the RMO, the Health Director, the Nurse in Charge, the CHN, the CHR, the CBWM, the REHM, the WTPO, the INAC representative, and any other stakeholders.

Response Process

Chief and Council are responsible for taking the necessary corrective actions. This includes notifying of their employees, both orally and in writing, to take the necessary corrective actions.

The EHO and other stakeholders are available to provide Chief and Council with advice, assistance, and recommendations.

The Water Treatment Plant Operator (WTPO) is responsible for implementing remedial measures, where the WTPO is authorized to do so by Chief and Council.

Some Occurrences Requiring an Unusual Occurrence Report

An Unusual Occurrence Report is required in case of

- Fuel spills involving, or occurring near, a raw water supply or distribution system;
- Acts of vandalism directed at a raw water supply or distribution system;
- An indication of adverse water entering the water distribution system, as a result of flooding conditions; or
- Discontinuity in the water distribution system, e.g., a broken water main.

An Unusual Occurrence Report is required for those occurrences listed above, but unusual occurrences reports should not be limited to just those occurrences.

It is recommended that in cases of any unusual occurrence, activities be supported by follow-up action such as a Boil Water Advisory/Boil Water Order, remedial steps and monitoring.

Unusual Occurrence Report

Community name: _____ Date: _____

Description of Occurrence:

- ❑ Fuel Spill
- ❑ Damage to Distribution System
- ❑ Vandalism
- ❑ Damage to Raw Water Supply
- ❑ Flooding
- ❑ other (specify): _____

Contacted to date:

- ❑ RCMP/Enforcement contacted
- ❑ Chief and Council
- ❑ RMO
- ❑ Nurse in Charge
- ❑ INAC
- ❑ Health Clinics/Hospitals
- ❑ EHO
- ❑ Public Works
- ❑ Water treatment plant operator
- ❑ other agencies contacted (specify):

Comments/Implications: _____

Further Actions Proposed: _____

Prepared by: _____ Approved by: _____

Date: _____ Date: _____

Boil Water Advisory

All members of the [_____] community of [_____] First Nation using the community drinking water supply are advised to:

Bring to a rolling boil for at least one (1) minute all water to be used for drinking.

- Water that has been boiled as above should be used for other activities where it may be ingested, including:
  - Brushing teeth or soaking false teeth
  - Washing fruits and vegetables
  - Eating or drinking a liquid (e.g., soup or tea) that will not be boiled for at least one (1) minute
  - Making ice cubes
  - Cooking
  - Feeding pets
  - Preparing baby food and formula
  - Bathing infants
  - Dish washing by hand
- Do not drink from any public drinking fountains supplied with water from the public water supply.
- Water used for other household purposes does not usually need to be boiled. Adults, adolescents and older children may shower, bathe or wash using tap water but should avoid swallowing the water. It is recommended to sponge bathe infants if using tap water. Add bleach to water used for dishes washed by hand. Tap water may be used for dishes washed by machine. Laundry may be washed in tap water, either by hand or by machine.

This advisory is effective immediately and will remain in effect until further notice.

ISSUED BY: CHIEF AND COUNCIL of the [_____] First Nation

SIGNED : _____

DATE: _____

Boil Water Advisory Lifted

All members of the [_____] community of [_____] First Nation using the community drinking water supply are advised that the boil water advisory has been lifted.

Test results from the most current water samples show that the community drinking water supply is of an acceptable microbiological quality at this time.

ISSUED BY: CHIEF AND COUNCIL _____ First Nation

SIGNED: _____

DATE: _____

SAMPLE
Letter from EHO to Chief and Council Concerning Issuing of a Boil Water Advisory

EHO Name
EHO Address

Date

Chief and Council
[……...] First Nation

Council Office Address

Dear Chief and Council:

Re: Boil Water Advisory – contaminated community drinking water supply

The analytical results of water samples collected on [date], from [location], for microbiological testing indicate that the water is contaminated with …… and consumption of the water can cause serious health effects. Attached is a copy of the sampling results for your review and records.

It is recommended that you notify your community members and other water users to bring their water to a rolling boil for at least one (1) minute prior to consumption. Boiling the water will kill any disease-causing organisms and will make the water safe for consumption. The water used for drinking, cooking, brushing teeth, washing dishes, washing fruit and vegetables, bathing infants, preparing baby food and formula, feeding pets, making ice cubes and other activities during which water may be ingested must be boiled. The use of bottled water from an approved source is an alternative to boiling.

It is recommended that you issue a **Boil Water Advisory** immediately and keep it in effect until the results of further water samples indicate that the water is safe to drink.

Please make sure this information reaches all users of the drinking water, government health officials, elected officials, the media, and the general public, orally and in writing, as per the Emergency Response Plan, as quickly as possible. One possible way to disseminate the Boil Water Advisory information to the community is to post the attached Boil Water Advisory notice in visible areas in or near all public places such as:

- Individual Houses
- Band Office
- Community Health Centre/Nursing Station
- Post Office
- Stores
- Schools
- Day Care Centres
- Recreational Facilities

Should you have any questions on the above, please contact the undersigned at: [……...]

Sincerely,

Regional Medical Officer/Environmental Health Officer

SIGNED _____

cc: Water Treatment Plant Operator
Nurse in Charge
FNIHB Regional and /or Zone Director
Regional Environmental Health Manager
Health Director
INAC representative
Regional Medical Officer
Community-Based Drinking Water Quality Monitor
Community Health Nurse
Community Health Representative
Tribal Council/Technical Service Providers
Appropriate Ontario First Nations Technical Services Corporation

SAMPLE
Letter from Chief and Council to Individual Community Resident, Concerning Issuing of a Boil Water Advisory

Chief and Council
[……...] First Nation

Date

House Occupant's Name
Address

Dear [resident/owner]:

Re: Boil Water Advisory – contaminated individual drinking water supply

The analytical results of water samples collected on [date], from [location], for microbiological testing indicate that the water is contaminated with …… and consumption of the water can cause serious health effects. Attached is a copy of the sampling results for your review and records.

You are advised to bring your water to a rolling boil for at least one (1) minute prior to consumption. Boiling the water will kill any disease-causing organisms and will make the water safe for consumption. The water used for drinking, cooking, brushing teeth, washing dishes, washing fruit and vegetables, bathing infants, preparing baby food and formula, feeding pets, making ice cubes and other activities during which water may be ingested must be boiled.

The use of bottled water from an approved source is an alternative to boiling.

This Boil Water Advisory is effective immediately and will remain in effect until test results from further water samples indicate the water is safe to drink. You will be notified by our office when your water is safe for drinking without boiling.

Should you have any questions on the above, please contact the EHO at [……] or the Band Office at [……...].

Sincerely,

Chief and Council [.....] First Nation

SIGNED _____

cc: Water Treatment Plant Operator
Nurse in Charge
FNIHB Regional and/or Zone Director
Regional Environmental Health Manager
Health Director
INAC representative
Regional Medical Officer
Community-Based Drinking Water Quality Monitor
Community Health Nurse
Community Health Representative
Tribal Council/Technical Service Providers
Appropriate Ontario First Nations Technical Services Corporation

SAMPLE
Letter from Chief and Council to Grocery Store, Daycare, School, Health Clinic, Dental Clinic, Restaurant (to be titled and sent individually)

Attention:
Store Manager/Owner, Daycare Manager, Principal, Health Director–Community Health Nurse/Nurse in Charge and (or) Dental Professional, Restaurant Manager/Owner

Boil Water Advisory

The water in the community system has been found to be contaminated and consumption of the water can cause serious health effects.

The following recommendations are intended to protect the health of all users of the drinking water.

During a Boil Water Advisory, the following steps must be taken:

- **Cook with tap water ONLY if the food will be boiled for at least one minute.**
- **Tap water should be brought to a rolling boil for at least one (1) minute before drinking or serving.**
- **Tap water should not be used to make drinks, juices, or fountain soft drinks.**
- **Tap water should not be allowed to come into contact with open wounds.**
- **Ice made from recent tap water should not be consumed.**
- **Provide an alternative safe source of water such as bottled water from an approved source for drinking and making coffee, etc.**
- **Provide single service cups and glasses for drinking water, coffee, etc.**
- **With resumption of food preparation, provide a safe source of water (bottled water) for any food preparation and hand washing in the food preparation area.**

- **Provide another safe source of water or hand sanitizer containing at least 60% ethanol or isopropanol for hand washing for staff and customers (washrooms and hand washing sinks).**

These steps should be followed until advised by Chief and Council that the situation has been resolved.

Chief and Council of the [……] First Nation

SIGNED _____

DATE: _____

SAMPLE
Letter from EHO to Chief and Council Concerning Lifting of a Boil Water Advisory

Health Canada – First Nations and Inuit Health Branch
Environmental Health Services
Address

Date

Chief and Council
Address

Dear Chief and Council:

Re: Boil Water Advisory lifted in (name of the community drinking water supply

Analytical results of water samples collected on [date], from [location] for microbiological testing indicate that all required conditions have been met to guarantee that as of today, (month, date, year) the water is safe for drinking. A copy of the water results is attached for your information.

Therefore I am officially recommending to lift the Boil Water Advisory that was in place in your community.

As such, following the normal recommended procedures of flushing the individual plumbing systems by opening faucets in houses and other buildings, the water from the distribution systems can be safely consumed by all individuals in the community. It is thus no longer required to boil water or to do any form of additional treatment.

We will continue to provide interpretation of the results of regular water testing that is done in your community and as required provide health recommendations related to water quality.

It is recommended that you notify your community members and other water users that the Boil Water Advisory has been lifted, and replace the previously posted "Boil Water Advisory" notices with the "Boil Water Advisory Lifted" notices (attached) in all public places such as:

- Band Offices
- Community Health Centre/Nursing Stations
- Post Office
- Stores
- Schools
- Day Care Centres
- Recreational Facilities

Should you have any questions on the above, please contact the undersigned at [.....].

Sincerely,

Regional Medical Officer/Environmental Health Officer

cc: Water Treatment Plant Operator
Nurse in Charge
FNIHB Regional and/or Zone Director
Regional Environmental Health Manager
Health Director
INAC representative
Regional Medical Officer
Community-Based Drinking Water Quality Monitor
Community Health Nurse
Community Health Representative
Tribal Council/Technical Service Providers
Appropriate Ontario First Nations Technical Services Corporation

SAMPLE
Letter from Chief and Council to Individual Community Resident, Concerning Lifting of a Boil Water Advisory

Chief and Council
[.....] First Nation

Date

House Occupant's Name
Address

Dear [resident/owner]:

Re: Boil Water Advisory lifted – private drinking water supply

The analytical results of water samples collected on **[date]**, from your house at **[address]**, for microbiological testing reveal the drinking water supply is of an acceptable microbiological quality at this time. The water meets the recommended limits in accordance with the latest edition of the *Guidelines for Canadian Drinking Water Quality*. Attached is a copy of the sampling results for your review and records.

The Boil Water Advisory is no longer in effect. You may now resume using your drinking water supply for consumption and other domestic purposes.

Should you have any questions on the above, please contact the undersigned at [.....].

Sincerely,

Chief and Council
[.....] First Nation

Date

SIGNED _____

cc: Environmental Health Officer
Water Treatment Plant Operator
Nurse in Charge
FNIHB Regional and/or Zone Director
Regional Environmental Health Manager
Health Director
INAC representative
Regional Medical Officer
Community-Based Drinking Water Quality Monitor
Community Health Nurse
Community Health Representative

SAMPLE
Letter from FNIHB to Chief and Council, Concerning Continuation of Boil Water Advisory

Health Canada
First Nations and Inuit Health Branch
Environmental Health Services
Address

Date

Chief and Council
Address

Dear Chief and Council:

Re: Continuation of Boil Water Advisory – contaminated community drinking water supply

The analytical results of re-sampled water collected on **[date]** from **[location]** for microbiological testing reveal the water is still contaminated. They are not in accordance with the latest edition of the *Guidelines for Canadian Drinking Water Quality*. Attached is a copy of the results of the water samples taken to date for your review and records.

Please make sure your community is aware of the continued **Boil Water Advisory**. Residents should continue to bring their water to a rolling boil for at least one minute before consuming it or using it for domestic purposes. Bottled water may be used as an alternative source. Boil Water Advisory signs should be kept posted in a visible area in or by public buildings (as mentioned in the previous Boil Water Advisory).

This **Boil Water Advisory** will remain effective until the results of future water samples indicate the water is safe for consumption.

Should you have any questions on the above, please contact the undersigned at [.....].

Sincerely,

Regional Medical Officer/Environmental Health Officer

SIGNED _____

cc: Water Treatment Plant Operator
Nurse in Charge
FNIHB Regional and/or Zone Director
Regional Environmental Health Manager
Health Director
INAC representative
Regional Medical Officer
Community-Based Drinking Water Quality Monitor
Community Health Nurse
Community Health Representative

7 Quality Assurance/Quality Control

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7.1 Quality Assurance/Quality Control

An effective Quality Assurance/Quality Control (QA/QC) program ensures the integrity of water quality samples and test results.

To maintain the QA/QC program, the following measures need to be taken:

- *Bacteriological samples* – the Environmental Health Officer (EHO) should submit at least 10% of all portable laboratory samples to accredited laboratories every month to ensure the test results are accurate and within acceptable limits.
- *Chemical, bacteriological, physical and radiological samples* – The EHO and Drinking Water Quality Monitor (CBWM) should have access to proficiency testing results from laboratories for each parameter, to confirm that these laboratories are operating within acceptable limits as designated by the accrediting agency.
- *Test media* – The CBWM and (or) the EHO must check the shelf life of test media frequently to ensure the integrity of the test materials.
- *Colilert system or similar system for* Escherichia coli *and coliform analysis* – The EHO should follow the QA/QC plan for the Colilert system (see section 7.2) or, ir using another system, the appropriate QA/QC plan at least semi-annually.
- *Assessment of CBWM* – The EHO should assess the sampling and testing techniques of the CBWM semi-annually or when the need arises.
- *Procedures* – The CBWM and (or) the EHO must follow laboratory procedures in compliance with those of that laboratory being used, including chain of custody for samples and their forms.
- *New Water Treatment Facility* – During the first six months of operation of a new water treatment facility being commissioned, the EHO should send 25% of all samples and duplicate, blank and (or) spiked samples to an accredited laboratory.

7.2 Quality Control Testing of the Colilert System or a Similar System for *E. coli* and Total Coliform Analysis by the Environmental Health Officer

The Colilert System is one of many systems developed and approved by the U.S. Environmental Protection Agency for presence/absence and most probable number (MPN) testing of total coliforms and *Escherichia. coli* (*E. coli*). Health Canada does not endorse the Colilert systems as the only system that could be used.

For at least 10% of all samples and whenever new media are to be used, people performing routine analyses should also test for quality control and performance. Quality Assurance and Quality Control (QA/QC) can be ensured by either sending samples to an accredited laboratory or using the QA/QC method for the system being used. The following is the Quanti-Cult® method for the Colilert system.

Use the Quanti-Cult sets provided by IDEXX (Cat. No. WKIT-1001) for this purpose. The Quanti-Cult® set contains three sets of vials, each set containing *Escherichia coli*, *Klebsiella pneumonia*, and *Pseudomonas aeruginosa*. Run one on every new batch.

Use the following procedures:

1. Discard coloured cap from rehydration fluid;
2. Transfer colourless cap to the rehydration fluid vial, and discard vial containing desiccant;
3. Insert rehydration fluid vial into foam rack;
4. Invert foam rack and incubate for 10 min. at 35°C;
5. Remove the vial from the rack. Shake vigorously to disperse microorganisms;

Important:

Be sure to follow the handwashing instructions in Section 5.2 of Chapter 5. These microorganisms can be pathogenic.

If spillage occurs at any time, follow the Spill Decontamination Procedure (Section 5.2).

After incubating the sample for 24 hours, one of the following should result:

- No colour, no fluorescence: Pseudomonas aeruginosa;
- Yellow colour, no fluorescence: Klebsiella pneumoniae;
- Yellow colour, fluorescence: *Escherichia coli* (*E. coli*).

If you observe results other than the above, contact the IDEXX company at 1-800-321-0207.

Record the results in the Quality Control log, as well as any problems and corrective actions taken.

6. Remove the cap and look at the inside surface to be certain no undissolved black particles are present. If they are present, re-incubate for another 10 min.;
7. Add the entire contents of Quanti-Cult vials to 100 mL of prewarmed (35 ± 0.5°C) labeled vessels containing sterile water;
8. Refer to Section 5.7 "Sample Analysis if Using the Colilert Procedure" and continue from step 4.

QA/QC for Bacti-Testing on Site

At least 10% of all portable laboratory samples should be tested on site and should be submitted to an accredited laboratory to ensure that tests are accurate and that bacterial levels in the drinking water are within acceptable limits.

QA/QC for bacti-samples should be done by the EHO on site using the Colilert system.

7.3 Quality Assurance Plan for Environmental Health Officers

Introduction

This plan outlines the quality assurance measures to be instituted by an Environmental Health Officer (EHO), if the community has a Community-Based Drinking Water Quality Monitoring Program.

Responsibilities

The EHO's responsibilities include:

- Periodically reviewing the overall process from sample collection to community notification of results;
- Reviewing records every quarter to ensure that the appropriate records are being maintained;
- Ensuring that the appropriate records are being retained for a minimum of two years;
- Keeping abreast of new information and procedures and advising the Community-Based Drinking Water Quality Monitor (CBWM) accordingly;
- Annually updating the Quality Assurance Plan and Operating Procedures Manual.

Orientation and Training

EHOs should train members of the Community-Based Water Quality Monitoring Program in water sampling, testing, equipment maintenance, and quality assurance measures. All orientation sessions should be documented. All program providers are to participate in pertinent training opportunities when available. On going training should be a program goal. All training should be documented in CBWM training files.

7.4 Quality Assurance Plan for Community-Based Drinking Water Quality Monitoring Program

Operating Procedures Manual

To identify the procedures to be used in the day-to-day operations of the laboratory and to ensure consistency in operations, the Environmental Health Officer (EHO) should develop an operating procedures manual, accessible to all laboratory personnel to document employee training. The manual should contain a signature sheet (see Section 7.5 for an example) that employees sign after reading and discussing the manual. At a minimum, the manual should contain procedures for the following, as detailed in this procedure manual:

- Hand washing;
- Sample collection;
- Sample handling and storage;
- Sampling and testing;
- Time and temperature monitoring;
- Notification and investigation of results;
- Repeat sampling;
- Media and sterile vessel handling and storage;
- Quality control testing;
- Laboratory start-up;
- Hazardous waste disposal; and
- Spill decontamination.

Orientation and Training

EHOs should provide the Community-Based Drinking Water Quality Monitor (CBWM) with training in water sampling testing, equipment maintenance, and quality assurance measures. All orientation sessions should be documented. All program providers are to participate in pertinent training opportunities when such opportunities are available. Ongoing training should be a program goal. All training should be documented in CBWM training files.

Equipment Maintenance

Incubators, sealers, and refrigerators should be maintained according to manufacturers' instructions.

Corrective Action Contingencies

Unacceptable results from quality control measures must be investigated and documented:

- If temperatures are not within acceptable ranges, equipment should be adjusted and additional monitoring should be conducted. If temperatures continue to be out of acceptable ranges, equipment manufacturers should be contacted.

- If quality control checks show that media are unacceptable, the EHO should investigate equipment and temperatures on site, review the analytical techniques, and contact the Colilert or similar water quality testing system manufacturers.
- Unacceptable results for split samples should result in an investigation and a review of techniques and sample analysis.
- Where applicable, training and employee development should be used to promote quality assurance.

7.5 Sample Signature Sheet for the Operating Procedures Manual

Signature Sheet Please sign sheet once Operating Procedures Manual has been read	
Name	Date
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

8 Emergency Planning and Response

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8.1 Emergency Response Planning for Drinking Water Systems

Responsible Authority

Chief and Council are responsible for ensuring that an Emergency Response Plan (ERP) is in place. The local area Environmental Health Officer (EHO), the Regional Medical Officer (RMO), the Health Director, the Nurse in Charge, the Community Health Nurse (CHN), the Community Health Representative (CHR), the Water Treatment Plant Operator (WTPO), the Indian and Northern Affairs Canada (INAC) representative, the Community-Based Drinking Water Quality Monitor (CBWM), and other appropriate stakeholders are to provide advice and guidance in drawing up an ERP for your drinking water system.

Why Do You Need an Emergency Response Plan for Your Drinking Water System?

As part of a multi-barrier approach to ensuring safe drinking water in First Nations communities, all drinking water systems must have a set of procedures in place for incidences and emergencies. These procedures should be in place well in advance of any event and cover off any number of incidences. They should include clear procedures for remediation of the situation and for communication with appropriate stakeholders.

All purveyors of drinking water systems need an ERP to refer to when emergencies threaten the health of people drawing water from that system.

As a purveyor of such a system, you need an ERP to ensure the safety of everyone using water from it and to meet regulatory requirements.

Your ability to respond rapidly and correctly to an emergency will help prevent unnecessary problems and help protect everyone using the water from your drinking water system. It may also prevent further complications.

Action — Not Reaction

When an emergency does happen, you should immediately take action to resolve it. A properly prepared, well-thought-out ERP will tell you exactly what to do and whom to call so that you can respond rapidly and effectively to any disruption or contamination of your water system.

To develop your own ERP, first you have to identify the various problems that could affect water quality or quantity, and then you have to determine specific solutions to each of those problems before they occur. The act of planning for an emergency may actually help you prevent one from happening. By making a thorough evaluation of all the potential "trouble spots," or vulnerable points in your particular system, you can identify steps you can take now that may prevent an emergency from happening, or

that enable you to respond quickly and appropriately if one does happen. Conditions that will require Boil Water notifications, requests for assistance, advice about tapping into alternative sources, and responses to other possible concerns should all be identified in advance.

What Should Your Plan Include?

List of contacts

Your ERP should include a list of all people and agencies that should be contacted in the event of any kind of emergency. This includes system owners and operators, repair people, alternative water suppliers, media representatives, government agencies, and of course the people who draw water from your system.

Periodically review and update your list of contacts at least once every two years to ensure that you have accurate contact information in the event of any kind of emergency.

List of potential emergency situations

When preparing your ERP, identify all potential emergency situations that could make the water unsafe, prevent the flow of water, or otherwise pose a health risk. These are some common categories:

- Contamination of source water (e.g., leakage of gas or other hazardous material into a body of water);
- Loss of source water;
- Backflow;
- Flooding (danger to intake, higher turbidity, higher bacteria);
- Broken water main;
- Mudslides above intake;
- Pump failure;
- Power failure;
- Chlorine gas leaks;
- Fire (forest fire in watershed or fire fighting with system water);
- Earthquakes; and
- Spills of chemically treated or disinfected water into fish-bearing streams.

You need to list only those immediate actions that you must take to deal with a specific emergency. Depending on the specifics of the particular emergency situation, longer term solutions or corrective activities you can develop with the assistance and input of local experts after you take care of these initial activities.

Communications

An effective communications plan will play a key role in how well you are able to respond to an emergency.

First, you must be able to alert all your system users as soon as possible, especially if the emergency entails risk to their health from drinking the water you provide.

More than anything else, your communications plan depends on the type of customers your system serves.

"Phone tree"

For very small, small, or medium-sized communities, your communications plan should include a "phone tree." This is a pre-arranged plan that allows every household in the community to receive an important message by telephone from their neighbours. People who are phoned have the names of other people to phone, who in turn have the names of other people to phone, and so on down the line until everyone on the community water system has been alerted.

Many small communities already have some kind of phone tree in place to respond quickly to other emergencies, such as alerting local volunteer fire fighters in the event of a fire. Talk to your local fire chief to find out whether you may be able to use the same system for a water system emergency.

If you are using a phone tree to send out a message, telling people not to drink the water or telling them to boil the water before they drink it, be sure that people who either do not have phones or who are not in when the call is made also get the message, for example a note may be left in the mailbox or slipped under the door to ensure residents get the message.

Media

Local media (radio, television and newspapers) can also carry warnings to the public if the situation is serious enough. Make sure you contact local media as part of your emergency planning to establish your credibility with them and to ensure that if you ever do have to call, they'll know who you are and how important it is to cooperate with you in alerting their readers or listeners.

For very small water systems, with fewer than a dozen connections all located near each other, a phone tree probably is not necessary. In these cases, if you (as the water purveyor) are already at the scene, you can pass the word around just by knocking on a few doors and getting others (volunteers) to do the same so everybody in the community is aware of the problem right away.

Signs

If you are the owner of an operation that makes drinking water available to non-residents (e.g., a gas station with a tap used by drivers of trailers or campers to fill up their water tanks, or a campground with a communal tap that people use to get their drinking water), you should hang a sign (see sample on the last page of this chapter) on the tap to tell people that the water may be contaminated or is considered unsafe for drinking or domestic use. Include this in your emergency plan, if this applies to you.

Having a list of all the people and agencies you will need to contact and knowing in what order to contact them will save you time when time is really important. Your contact list should also act as a checklist, to make sure you cover everyone you are supposed to reach. In addition, it should remind you of local resource personnel who could help you respond to an emergency, if necessary.

Maps

Purveyors of larger waterworks should consider developing a map of their system that shows the locations of

- Mains;
- Critical control points (e.g., intakes, pump houses, shut-off valves, connections between alternative sources, pressure zones);
- Access routes, roads, or trails to these critical control points;
- Location of emergency contacts;
- Tools and maintenance equipment;
- High-water-use industries; and
- High-risk facilities, such as schools, day care centres, hospitals, and long-term care facilities.

Equipment operations

Standard operating procedures for maintaining generators or switching to alternative power supplies, including schematics of electrical systems in pump houses, may form part of your ERP and should be located next to the equipment to which they refer.

Examples of ERPs are attached. You should use these as a guide for outlining your own required immediate responses on the forms provided.

8.2 Examples of Emergency Situations and Possible Responses

(Contact phone number list must be kept with this list)

Note: These examples may not be appropriate for your particular water system. The type of response, the contact list, and the order of response will all vary with the size of your system, the type of source you use, and other factors.

Contamination of Source (e.g., spills, vehicle accident)

Actions

- Shut down pump;
- Notify the local community health unit;
- Notify area Environmental Health Officer;
- Notify all users;
- Contact government agencies (see below) for advice and assistance;
- Contact local media for public service announcement (where all customers cannot be notified by phone); and
- Arrange an alternative water source, if necessary (e.g., bottled water, bulk hauler, storage tank).

Contacts

- Environmental health services of the First Nations and Inuit Health Branch;
- Indian and Northern Affairs Canada;
- Local community health unit (environmental health and nursing departments);
- Federal and provincial emergency preparedness units;
- Police;
- Environment Canada;
- Provincial Ministry of the Environment;
- Department of Fisheries and Oceans; and
- Others as necessary, depending on severity.

Loss of Source (e.g., intake damaged, creek dried up)

Actions

- Ensure that pump is shut off (to protect the pump);
- Notify all users;
- Contact government agencies (see Section 8.3) for advice and assistance; and
- Arrange an alternative water source (e.g., bottled water, bulk hauler, storage tank).

Contacts

- Local community health unit;
- Area Environmental Health Officer;

- Federal and provincial Ministries of the Environment; and
- Others as necessary.

Flood Conditions

Actions

1. Notify all users of the potential for water contamination, loss of pump or power, etc. (users should be advised to store some drinking water in advance and for any suspect water to boil it for one minute at a rolling boil or to disinfect with chlorine in flood conditions);
2. Phone government contacts;
3. Contact local media for a public service announcement (in situations in which all customers cannot be notified by phone); and
4. Arrange an alternative water source, if possible (e.g., bottled water, bulk hauler, storage tank).

Contacts

- Local community health unit;
- Area Environmental Health Officer;
- Provincial and federal emergency preparedness units;
- Environment Canada; and
- Provincial Ministries of the Environment.

Broken Water Main

Actions

1. Reduce pressure (but maintain enough pressure to prevent backflow);
2. Call someone for repairs (e.g., plumber, excavator);
3. Notify all users of interruption of service;
4. Advise local community health office; and
5. Arrange an alternative water source if necessary (e.g., bottled water, bulk hauler, etc).

Contacts

- Local community health unit; and
- Area Environmental Health Officer.

Chlorinator Failure

Actions

1. Advise local community health office;
2. Notify all users to boil water for one minute at a rolling boil or to use other disinfection procedures, in accordance with the recommendation of local health officials, as detailed in Chapter 6; and
3. Arrange chlorinator repairs.

Contacts

- Local community health unit;
- Area Environmental Health Officer; and
- Chlorinator manufacturer.

Pump Failure

Actions

1. Notify all users of interruption of service;
2. Call the pump manufacturer for repairs;
3. Advise local community or public health office (if interruption not short term); and
4. Arrange an alternative water source, if necessary (e.g., bottled water, bulk hauler, etc.).

Contacts

- Local community health unit; and
- Area Environmental Health Officer.

Power Failure

Actions

1. Call the local hydroelectric company;
2. Start the back up generator;
3. Notify all users about interruption of service if the back up is incapable of maintaining supply;
4. Advise local community/public health office; and
5. Arrange an alternative water source if necessary (i.e., bottled water, bulk hauler, etc).

Contacts

- Local community health unit; and
- Area Environmental Health Officer.

Backflow or Back Siphonage

Actions

- Advise the Regional Medical Officer at local health unit;
- Notify users to boil water for one minute at a rolling boil or to use other disinfection procedures, in accordance with the recommendations of local health officials; and
- Purge and disinfect lines, as directed, after the corrections have been made.

Contacts

- Local community health unit; and
- Area Environmental Health Officer.

8.3 Contact List for an Emergency Response Plan

Personnel

	Phone	Fax
Operator's name		
Staff name		
Staff name		
Staff name		
Staff name		

Emergency contact

	Phone	Fax
Regional Medical Officer		
Environmental Health Officer		
Chief and Council		
Provincial Emergency Response Office		
Federal Emergency Response Office		
Emergency Preparedness Program		
Police		
Environment Canada		
Department of Fisheries and Oceans		
Indian and Northern Affairs Canada		
Fire department		
Radio station		
Local hydro company		
Tribal Council Engineer		
Hospital		
Pump manufacturer		
Chlorinator manufacturer		
Excavation services		
Plumbing services		
Newspaper		
TV station		
Bulk water hauler		
Bottled water supplier		
Provincial Ministry of Environment		

8.4 Action List for an Emergency Response Plan

Type of emergency: _____

Actions: _____

_____

_____

_____

_____

_____

Contacts: _____

_____

Type of emergency: _____

Actions: _____

_____

_____

_____

_____

_____

Contacts: _____

_____

Type of emergency: _____

Actions: _____

_____

_____

_____

_____

_____

Contacts: _____

_____

8.5 Checklist for Preparing an Emergency Response Plan

1. Emergency phone contact list including

- ❑ Personnel
- ❑ Government agencies
- ❑ Repair services

2. Emergency procedures

Possible emergency situations:

- ❑ Contamination of source
- ❑ Chlorinator failure
- ❑ Power failure
- ❑ Spills of disinfected water into fish-bearing streams
- ❑ Loss of source
- ❑ Broken water main
- ❑ Backflow or back siphonage
- ❑ Earthquake
- ❑ Flood conditions
- ❑ Pump failure
- ❑ Chlorine gas leaks
- ❑ Fire

- ❑ Response plan (for each type of emergency)
- ❑ Personnel assignments and responsibilities

3. Map of system showing

- ❑ Mains
- ❑ Shut-off valves
- ❑ Location of emergency contact list, tools, maintenance equipment
- ❑ Critical control points
- ❑ Access routes to critical control points
- ❑ High risk facilities
- ❑ Schools
- ❑ High water-use industries
- ❑ Intake(s)
- ❑ Pump house
- ❑ Day care centres
- ❑ Long-term care facilities
- ❑ Hospitals

4. Electrical schematics

- ❑ Generators
- ❑ Disinfection equipment and room

5. General procedures

- ❑ Generator start-up
- ❑ Disinfection operation
- ❑ Power source change over
- ❑ Disinfection procedures for wells and distribution system

Sample sign:

Warning

This water is considered

Unsafe for drinking

or domestic use

9 Public Awareness and Involvement

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9.1 Characteristics of Good Quality Water

- Chemically and microbiologically safe to consume;
- Some flavour;
- Palatable;
- Clear;
- Non-corrosive; and
- Non-staining.

9.2 Can You Tell if Water Is Safe to Drink?

- By looking?
- By smelling?
- By tasting?

The answer is No.

9.3 Home Water Treatment Devices

Introduction

Federal government departments do not provide funding for home water treatment devices. However, where such devices are in personal use, the following should be considered.

Water treatment devices can improve aesthetic parameters, such as the taste, smell, and appearance of the water, or they can remove undesirable chemicals and minerals.

Several types of devices are used to improve the aesthetic qualities of drinking water and to remove chemicals. Those with an activated carbon filter are the most common, and they are usually installed at the point of use (POU). Activated carbon filters are generally more effective in removing organic chemicals. Other processes used by devices are reverse osmosis, absorption, ion exchange, and distillation.

While Health Canada does not recommend specific brands of treatment devices, it strongly recommends that treatment devices be certified by an accredited certification body as meeting the appropriate NSF International/American National Standards Institute (ANSI) drinking water treatment unit standards. For further information, refer to the following website: **www.nsf.org**.

The activated carbon filters used in many water treatment devices can, in themselves, become a source of contamination. Over time, the filter can become saturated with chemical contaminants, resulting in the release of these compounds into the finished water, possibly at even higher concentrations than in the source water. As well, build up of organic matter on the filter can lead to bacterial growth over even short periods e.g., overnight. The health risks associated with using a water treatment device with an activated carbon filter can be reduced by taking the following precautions:

- Use only on water supplies known to be free of microbial contaminants;
- Change filters or units (if unit is disposable) frequently, then flush for at least 30 seconds before each use; and
- Carefully follow the manufacturer's instructions for installation and service, and filter replacement schedule.

Water not consumed immediately after treatment should always be stored in the refrigerator to avoid microbial contamination.

9.4 When Buying a Water Treatment Product

Ask for...

- A letter from the salesperson stating what improvements will come with the use of the product;
- Copies of sales brochures and technical reports;
- Verification that the product has undergone independent testing; and/or
- Verification of certification to appropriate NSF International/ANSI standard related to the water improvement you are interested in;
- Expected operating costs including cost of replacement filters, and;
- Names and contact information of past or current customers you can talk to who have bought and used the product.

If the Product Requires the Purchase of Chemicals, Ask for...

- The material safety data sheet for each chemical;
- The manufacturer's recommendations on using the chemicals;
- Verification that the chemicals are certified to the appropriate NSF International/ANSI standard for use with drinking water supplies; and
- Verification that no extra cost is involved in being trained in the proper use of the product.

Finally...

Call the Better Business Bureau and ask if anyone has filed a complaint about the product or salesperson.

9.5 Emergency Water Treatment and Storage

Can drinking water be taken from surface water sources?

Water obtained from surface water sources, such as lakes, rivers, reservoirs, and ponds, is not considered safe for drinking and must be treated.

How do I treat water that has potential bacteriological contamination?

Boiling

Boil the water for one (1) minute at a rapid rolling boil. After the water has cooled, pour it back and forth from one container to another to eliminate the flat taste.

Chlorine

Add 1.25 mL (1/4 teaspoon) of regular liquid household bleach (such as Javex®) to 3.8 L of water. Mix well and allow to stand for 15 minutes.

Note: ***DO NOT USE*** *scented bleaches, colour-safe bleaches, or bleaches with added cleansers.*

Where should I store treated water?

Water should be stored in clean/disinfected bottles or containers made of "food grade" plastic. Use a 1:10 ratio (bleach to water) dilution to disinfect all containers. After use, the bleach water solution should be flushed away. **DO NOT USE** containers that have been used to store bleach, detergent, milk, and (or) other chemicals.

How long can I store it?

Water kept in well-sealed containers can be kept for at least six months (commercially stored water can be kept for up to a year). Write the fill date on each container to help you remember when to replace the water.

To increase the shelf life of water, store it in a cool, dark place and group the containers together in dark plastic bags to keep out the light.

How much water do I need in an emergency?

General guideline

- Adult – 1.5 L per day for drinking purposes; and
- Child – 1.0 L per day for drinking purposes.

Additional water needed for personal hygiene

- 4.5 L per person per day.

9.6 How to Use Water Safely During a Boil Water Advisory or a Boil Water Order

What are the reasons for a Boil Water Advisory or a Boil Water Order?

Boil Water Advisories or Boil Water Orders are issued for a number of different reasons:

- Microbiological testing of water samples, has revealed the presence of organisms such as bacteria, viruses, or protozoa;
- Other information indicates the water is not safe or that the quality can no longer be guaranteed, such as
  - Significant deterioration in source water quality,
  - Equipment malfunction during treatment or distribution,
  - Inadequate disinfection or disinfection residuals,
  - Unacceptable microbiological quality,
  - Unacceptable turbidities or particle counts, or
  - Situations in which operation of the system would compromise public health; or
- An outbreak of illness in the community has been linked to the consumption of drinking water.

The restrictions on water use will depend on the situation and the reason for issuing a Boil Water Advisory or Boil Water Order. Always follow your Environmental Health Officer's recommendations on water use.

How do I use water when a Boil Water Advisory or Boil Water Order has been issued?

Tap water should not be used for drinking, mixing infant formula or juices, cooking, making ice, washing fruits and vegetables, or brushing teeth. Instead, use boiled water or bottled water. The water should be brought to a rapid rolling boil for one (1) minute. If there are children in the home, place the pot on the back burner to avoid scalds. Boil only as much water in the pot as you can comfortably lift without spilling. The water should then be cooled and poured into a clean container or refrigerated until you are ready to use it. Discard all ice that was made previously and disinfect the ice cube trays. Make ice using boiled, cooled water.

Will boiling water protect me from all types of drinking water contamination?

No. Boiling water will only protect you against bacteria, viruses, and protozoa. Boiling water does not destroy chemical contaminants, such as nitrate.

Can I take a bath?

Adults and teens may shower with untreated water as long as no water is swallowed. Older children can also be given a shower with a hand-held showerhead, avoiding the face. Younger children should be sponge-bathed, instead of bathing in a tub, because they are likely to swallow tub water.

What is disinfection?

Disinfection is a cleaning process that destroys most disease-causing microorganisms (e.g., pathogens).

Can I use the water for hand washing?

If a oil Boil Water Advisory or Boil Water Order has been issued as a precaution and there is no outbreak of human illness, you do not need to disinfect your hands with bleach solution or alcohol, as described below.

If the Boil Water Advisory or a Boil Water Order has been issued because of an outbreak of illness, you can use water for hand washing after the following emergency water treatment:

1. Place 1.5 ounces (1/5 cup, or about 45 mL) of liquid household bleach in 10 Imperial gallons (45 L) of water (this will provide a chlorine application of about 50 mg/L).
2. Mix and let stand for at least 10 minutes prior to use.

How else can I disinfect my hands?

You can use alcohol-based hand disinfectants that contain more than 60% alcohol. These products are widely used in health care settings after hands are washed or in situations in which water is not available. The wet wipes used for cleaning babies when changing diapers are not effective for disinfecting hands and should not be used for this purpose.

My child was ill with diarrhea. Should I clean and disinfect toys?

Yes. Toys should be cleaned and disinfected. If the toys are visibly soiled, wash them first with soap and water and then disinfect them with a freshly prepared bleach solution of 1/4 cup (about 60 mL) of bleach in one (1) Imperial gallon (4.5 L) of water. Dip toys into this solution and air-dry them. Cloth and plush toys could be machine washed or dry-cleaned.

How do I disinfect counter-tops, chopping boards, containers, dishes, and utensils when a Boil Water Advisory or Boil Water Order has been issued?

Counter-tops, chopping boards, containers, dishes, and utensils that have come into contact with contaminated water should be washed with soap and hot water first, then disinfected with a bleach solution stronger than that used for emergency hand disinfection. Mix 1/4 cup (about 60 mL) of bleach into one (1) Imperial gallon (4.5 L) of water for this purpose. Do not reuse or store this solution; make it fresh daily.

I have a dishwasher. Is it safe to use?

If your dishwasher has a hot setting, it will safely disinfect dishes. If your dishwasher does not have a hot setting, do the following:

1. Soak the dishes for one (1) minute in a solution of one (1) ounce (1/8 cup or 30 mL) of bleach mixed with 3 Imperial gallons (13.5 L) of lukewarm water after the wash cycle is finished. This will provide a chlorine application of about 100 mg/L.
2. Let dishes air-dry.

Should I change the way I'm doing laundry?

No. Continue doing laundry the way you usually do. If sheets or clothes are heavily soiled with faeces, carefully remove faeces before you place the sheets in the washer, with as little handling as possible. Use rubber gloves when handling heavily soiled sheets.

Is the water safe to fill wading pools for children?

No. The water is not safe for use in wading pools. Water can get into the mouths of small children, providing a possibility of infection.

I have a water filtration device installed. Does this make the water safe for drinking or cooking?

No. Bring filtered water to a rolling boil for one (1) minute before drinking it or using it for cooking. When the Boil Water Advisory or Boil Water Order has been lifted, change the filter and disinfect the equipment.

My doctor told me I am immuno compromised. What should I do?

Severely immunocompromised individuals should always boil their tap water for drinking, preparing food, beverages, ice cubes, washing fruit and vegetables, or brushing teeth. Infant formulas should be prepared using boiled tapwater at all times. In the event that boiling is not practical, your local public health authority or other responsible authority may direct you to disinfect the water using household bleach, or to use an alternative supply known to be safe.

How is the decision made to lift a Boil Water Advisory or a Boil Water Order?

The Boil Water Advisory or a Boil Water Order should remain in effect until test results from two consecutive sets of samples show the water is safe to drink. Samples should be taken from all parts of the distribution system that has been affected. The water purveyor may decide more or fewer samples should be taken before a decision is made.

What should I do after the Boil Water Advisory or Boil Water Order is lifted?

After the Boil Water Advisory or a Boil Water Order has been lifted,

- Run cold water faucets for one (1) minute before using the water;
- Run drinking water fountains for one (1) minute before using the water;

- Flush all garden hoses by running cold water through them for one (1) minute; and
- Run water softeners through a regeneration cycle.

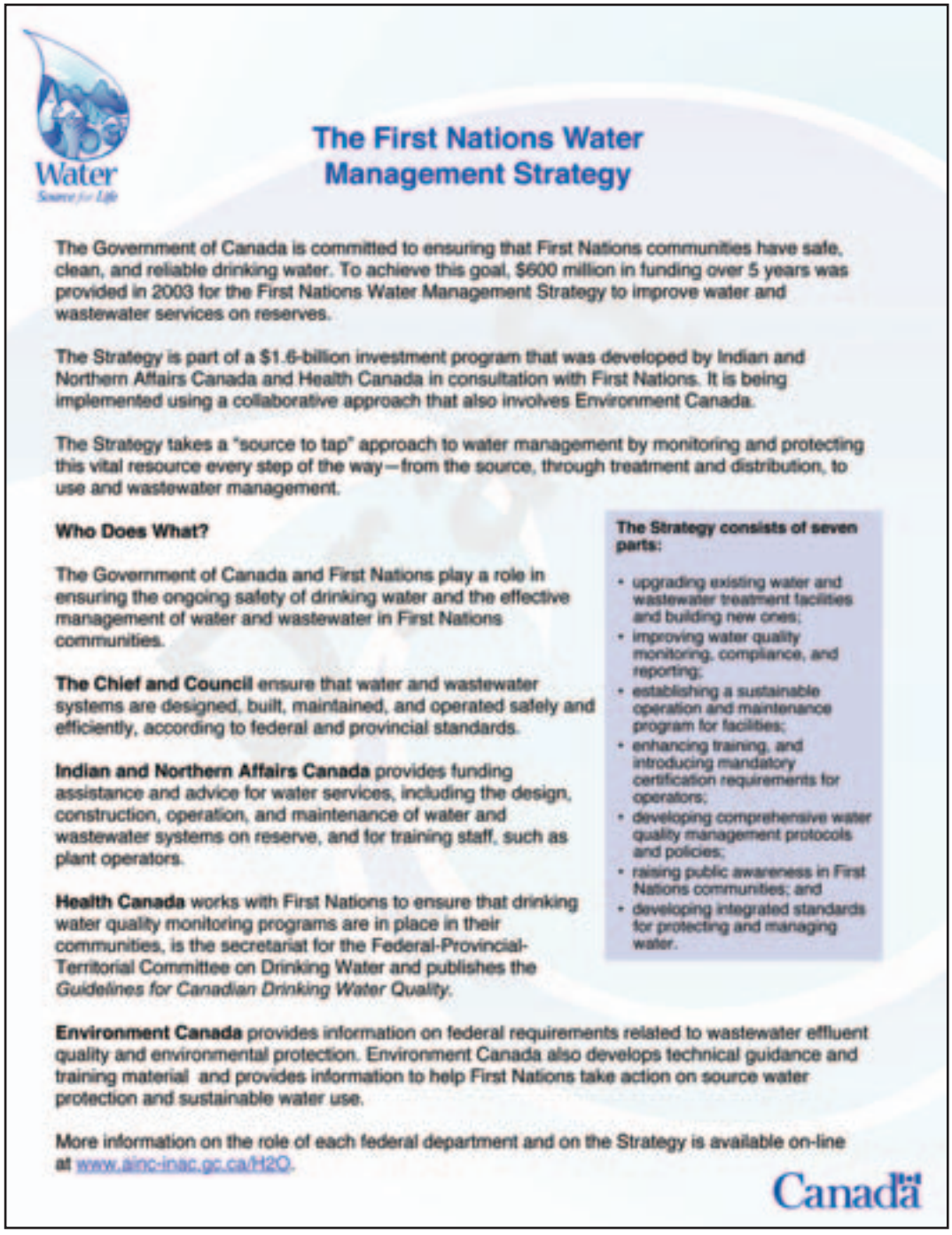
I wash dishes by hand. How do I disinfect them?

You could use boiled water for washing dishes. Dishes washed in soap and hot water can also be rinsed in boiled water or disinfected with the following bleach solution. Mix one (1) ounce (about 30 mL) bleach in 3 Imperial gallons (13.5 litres) of water at room temperature for at least one (1) minute. Let dishes air-dry.

I have an automatic icemaker. Is it safe to use?

No. When an advisory is issued any ice in the unit should be discarded and the water supply to the unit shut off if possible. When the advisory is lifted the unit should be disinfected and flushed according to the manufacture's instructions. Discard the first few batches of ice. Make ice using boiled, cooled water.

9.7 First Nations Water Management Strategy – Who Does What?



Water
Source for Life

The First Nations Water Management Strategy

The Government of Canada is committed to ensuring that First Nations communities have safe, clean, and reliable drinking water. To achieve this goal, $600 million in funding over 5 years was provided in 2003 for the First Nations Water Management Strategy to improve water and wastewater services on reserves.

The Strategy is part of a $1.6-billion investment program that was developed by Indian and Northern Affairs Canada and Health Canada in consultation with First Nations. It is being implemented using a collaborative approach that also involves Environment Canada.

The Strategy takes a "source to tap" approach to water management by monitoring and protecting this vital resource every step of the way—from the source, through treatment and distribution, to use and wastewater management.

Who Does What?

The Government of Canada and First Nations play a role in ensuring the ongoing safety of drinking water and the effective management of water and wastewater in First Nations communities.

The Chief and Council ensure that water and wastewater systems are designed, built, maintained, and operated safely and efficiently, according to federal and provincial standards.

Indian and Northern Affairs Canada provides funding assistance and advice for water services, including the design, construction, operation, and maintenance of water and wastewater systems on reserve, and for training staff, such as plant operators.

Health Canada works with First Nations to ensure that drinking water quality monitoring programs are in place in their communities, is the secretariat for the Federal-Provincial-Territorial Committee on Drinking Water and publishes the *Guidelines for Canadian Drinking Water Quality*.

The Strategy consists of seven parts:

- upgrading existing water and wastewater treatment facilities and building new ones;
- improving water quality monitoring, compliance, and reporting;
- establishing a sustainable operation and maintenance program for facilities;
- enhancing training, and introducing mandatory certification requirements for operators;
- developing comprehensive water quality management protocols and policies;
- raising public awareness in First Nations communities; and
- developing integrated standards for protecting and managing water.

Environment Canada provides information on federal requirements related to wastewater effluent quality and environmental protection. Environment Canada also develops technical guidance and training material and provides information to help First Nations take action on source water protection and sustainable water use.

More information on the role of each federal department and on the Strategy is available on-line at www.ainc-inac.gc.ca/H2O.

Canada

Please contact the Health Canada's Drinking Water Task Force, FNIHB, for copies of this document

10 Tools for Environmental Health Officers

Table of Contents

Barriers in Place, From Source to Tap 10.1.1

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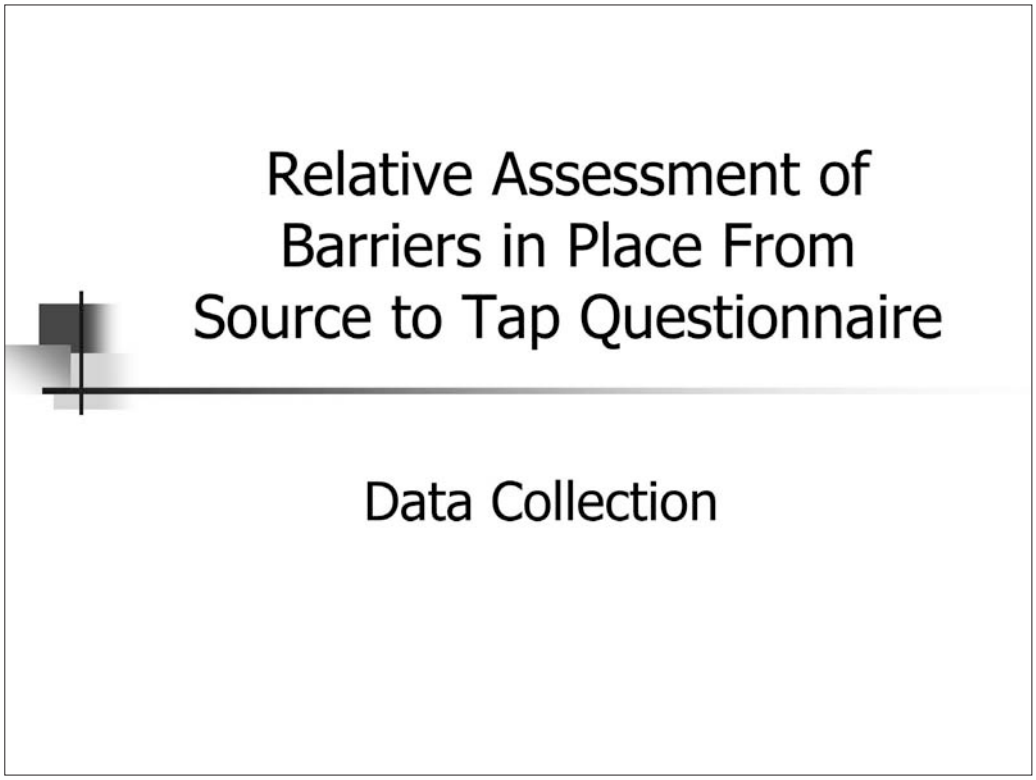
Community-Level Tool for Environmental Health Officers to Use in Identifying Barriers in Place From Source to Tap 10.3.1

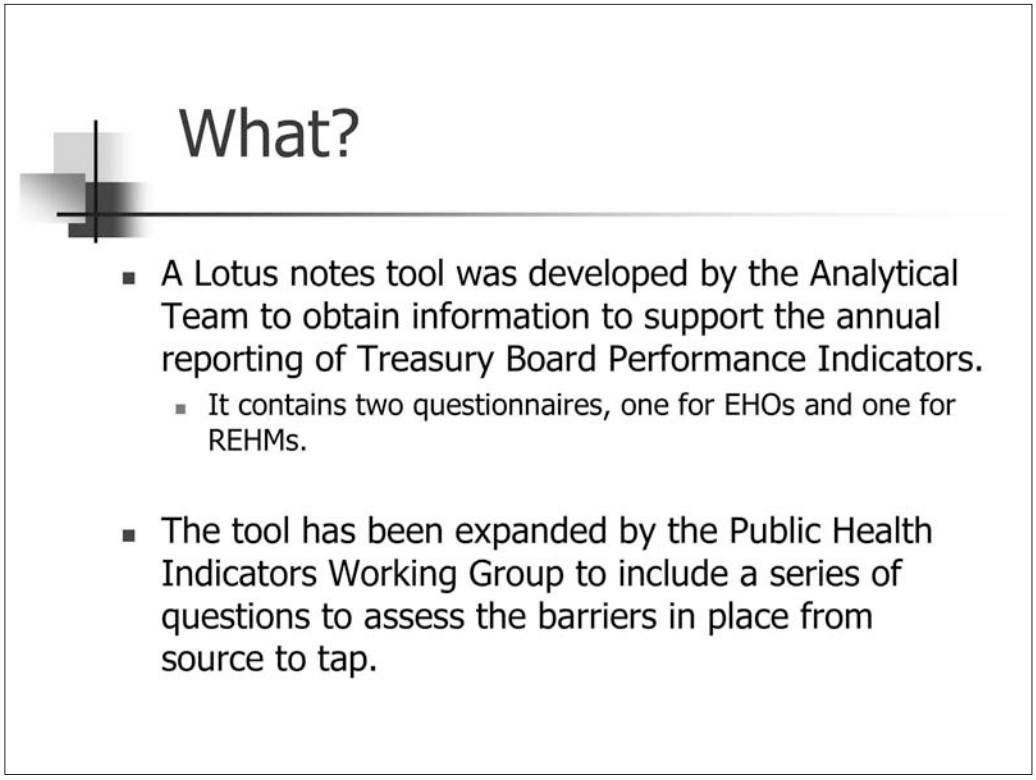
10.1 Barriers in Place, From Source to Tap

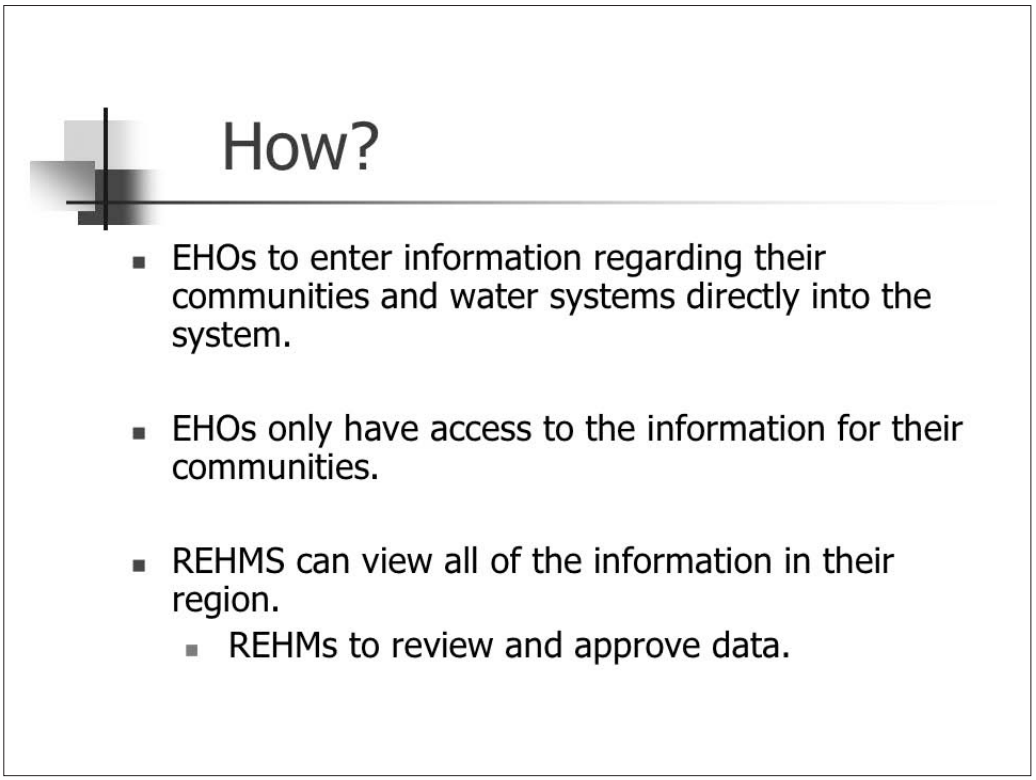
Environmental Health Officers (EHOs) and Regional Environmental Health Managers (REHMs) must annually enter public health risks, from source to tap, and information on Community-Based Drinking Water Quality Program performance indicators for First Nations communities south of 60°, at a community level and regionally, respectively, into the Water Management Systems database. This is done by completing the *Relative Assessment of Barriers in Place From Source to Tap Questionnaire* for all piped distribution systems with five or more connections and trucked distribution systems in First Nations communities south of 60. For instructions on how to complete this assessment, see section 10.2.1. Data analysis is done by FNIHB headquarters and is then shared with regional offices, who will ensure the results are shared with EHOs, First Nations communities and other appropriate stakeholders, and Indian and Northern Affairs Canada. The analysis of the public health risk and program performance indicators are designed to assist the Government of Canada and First Nations communities in decision making.

At their discretion, EHOs may also use the attached *Community-Level Tool for Environmental Health Officers to Use in Identifying Barriers in Place from Source to Tap* as a check list in order to educate members of First Nations communities, including Chiefs and Councils, on the associated potential public health risk factors and assist them in addressing the main elements of ensuring clean, safe and reliable drinking water quality in their community from source to tap. For a copy of this checklist, see section 10.3.1.

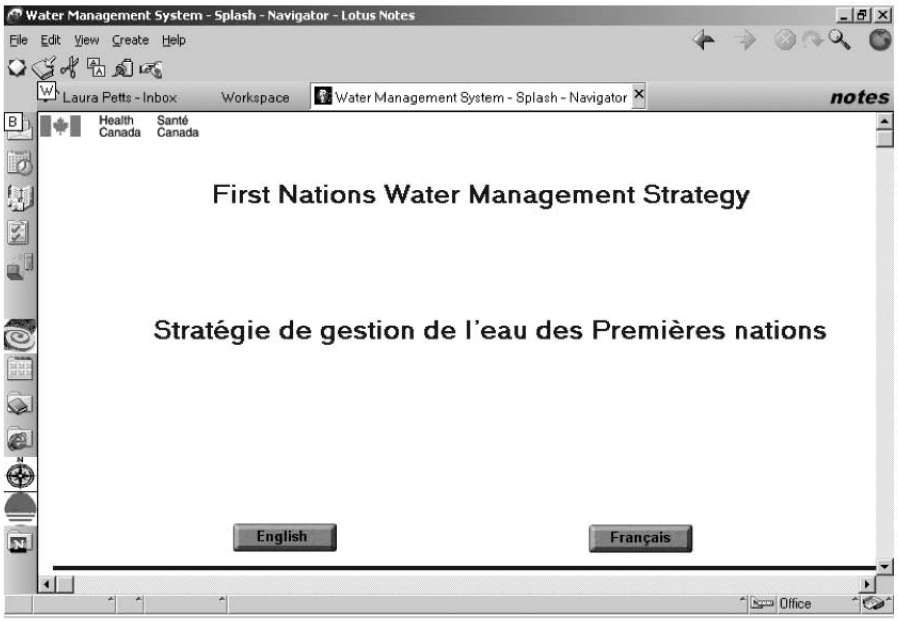
10.2 Instructions for Completing the Relative Assessment of Barriers in Place From Source to Tap Questionnaire



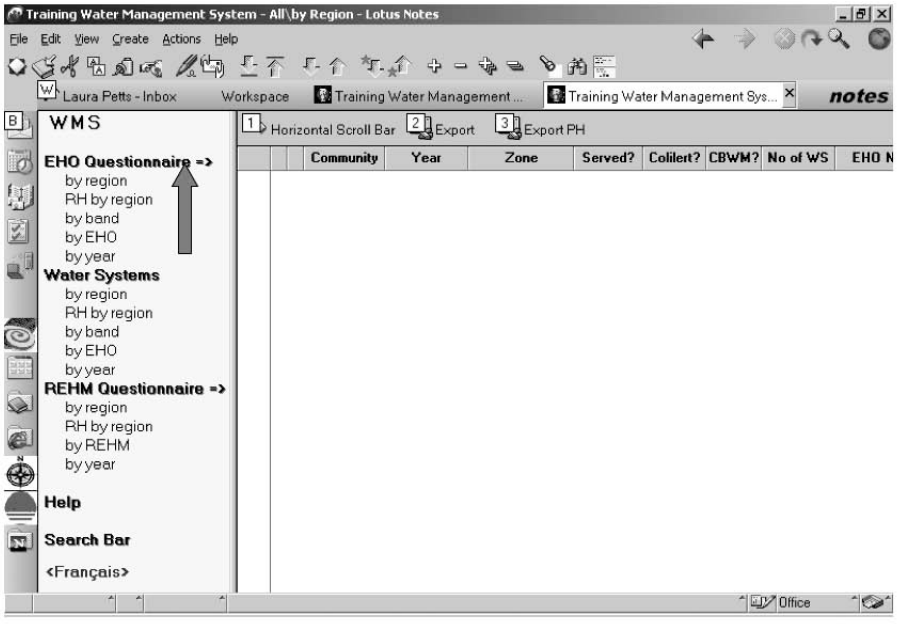

What?
A Lotus notes tool was developed by the Analytical Team to obtain information to support the annual reporting of Treasury Board Performance Indicators.
It contains two questionnaires, one for EHOs and one for REHMs.
The tool has been expanded by the Public Health Indicators Working Group to include a series of questions to assess the barriers in place from source to tap.


How?
EHOs to enter information regarding their communities and water systems directly into the system.
EHOs only have access to the information for their communities.
REHMS can view all of the information in their region.
REHMs to review and approve data.

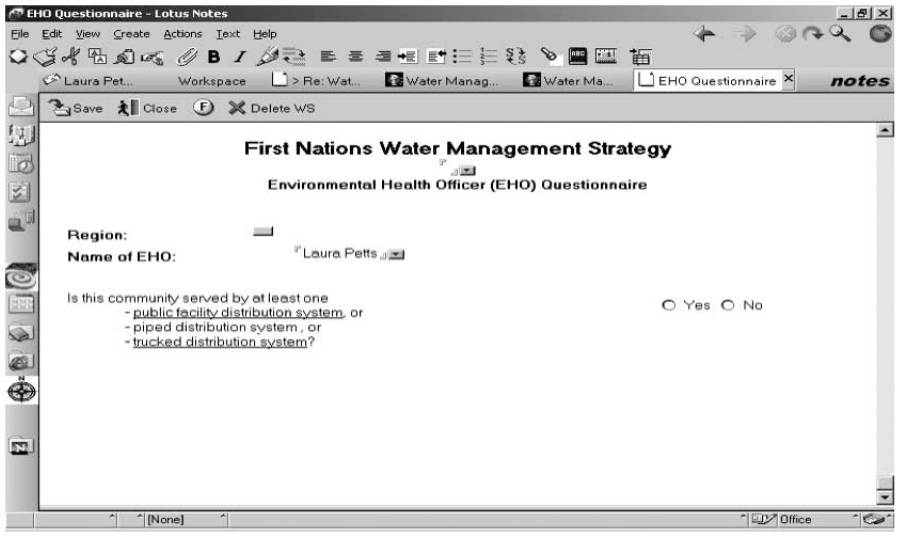
Click on the English button to commence….



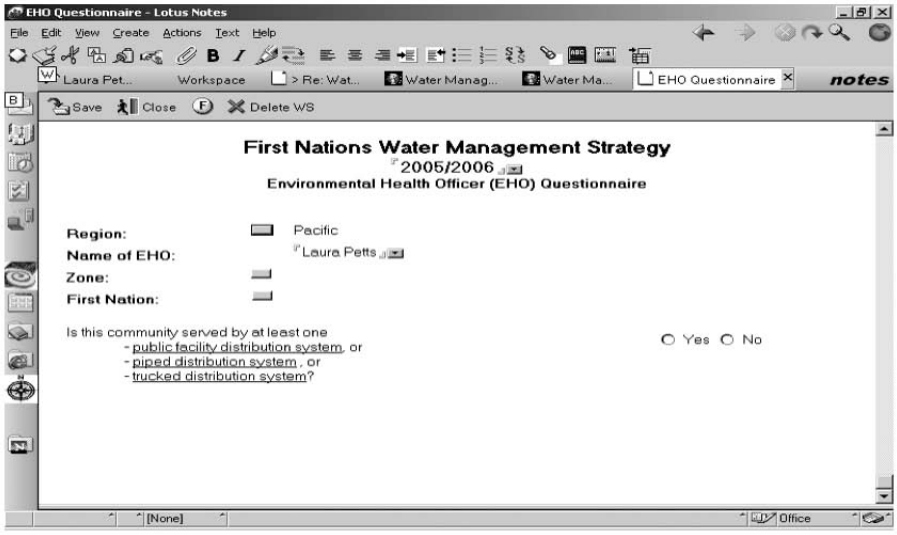
In the menu to the left of the screen, left click on the words "EHO Questionnaire"…



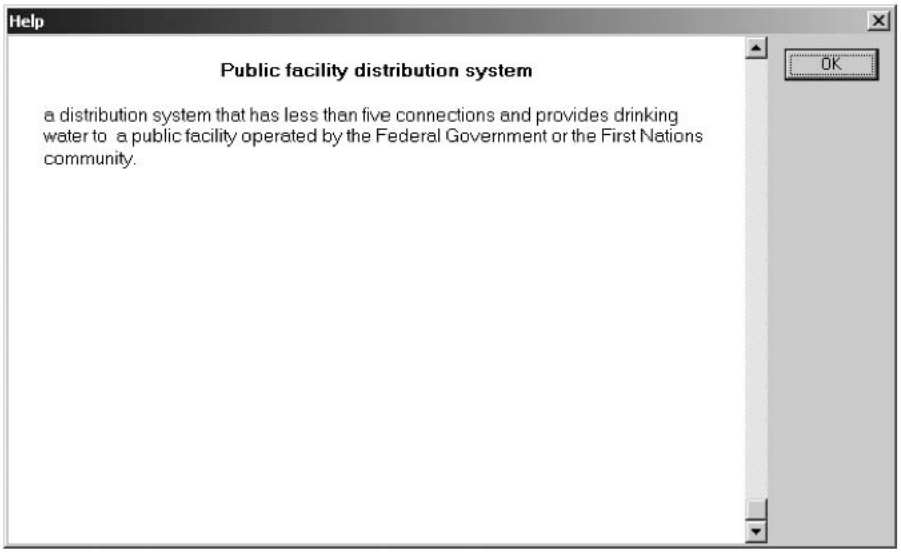
Start the data entry for each community in this screen. Where there is a "button" with an arrow or a "?", click on this button and choose from the options that it provides.


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura Pet... Workspace > Re: Wat... Water Manag... Water Ma... EHO Questionnaire
notes
Save Close Delete WS
First Nations Water Management Strategy
Environmental Health Officer (EHO) Questionnaire
Region:
Name of EHO: Laura Petts
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
[None]
Office

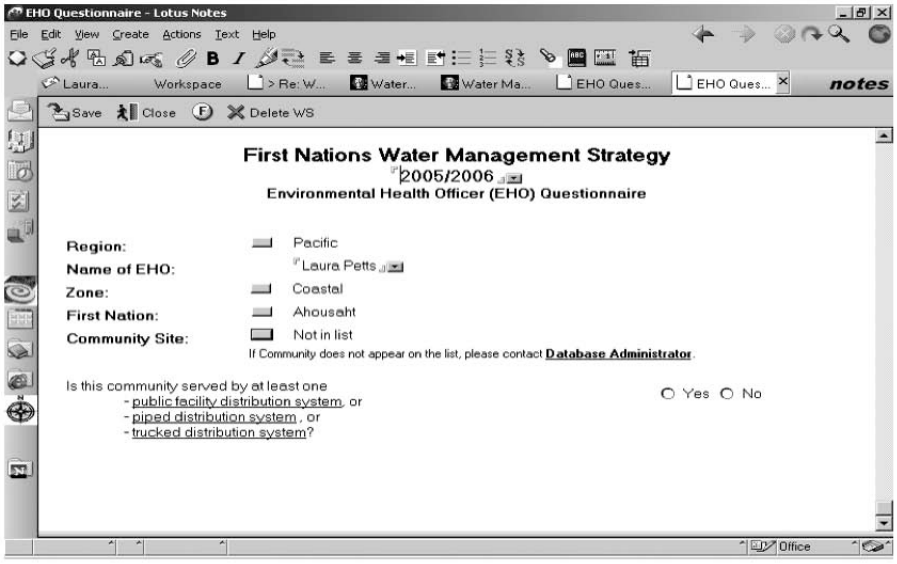
Clicking on the underlined words on the screen will provide the definitions of the terms in a pop-up. For Example, clicking on public facility distribution system…..


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura Pet... Workspace > Re: Wat... Water Manag... Water Ma... EHO Questionnaire
notes
Save Close Delete WS
First Nations Water Management Strategy
2005/2006
Environmental Health Officer (EHO) Questionnaire
Region: Pacific
Name of EHO: Laura Petts
Zone:
First Nation:
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
[None]
Office

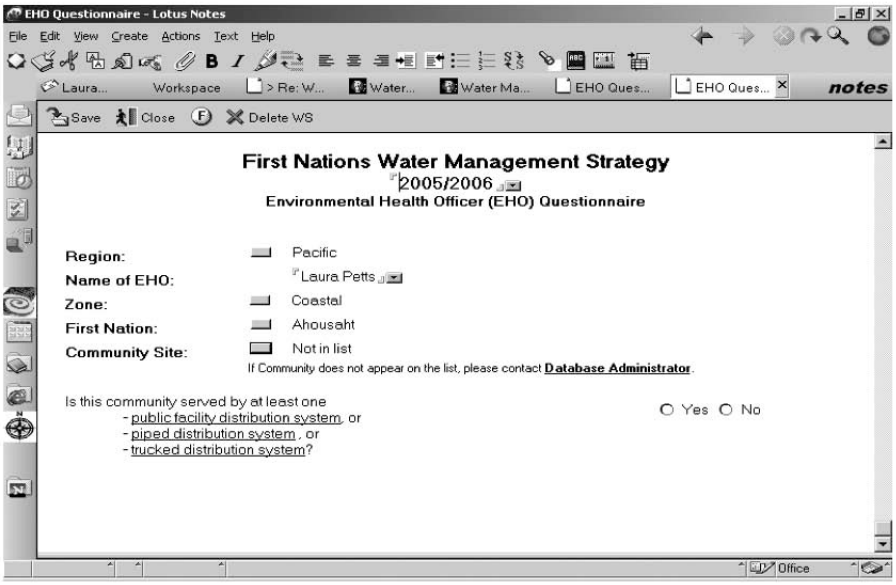
…will bring up the following box….


Help
Public facility distribution system
a distribution system that has less than five connections and provides drinking water to a public facility operated by the Federal Government or the First Nations community.
OK

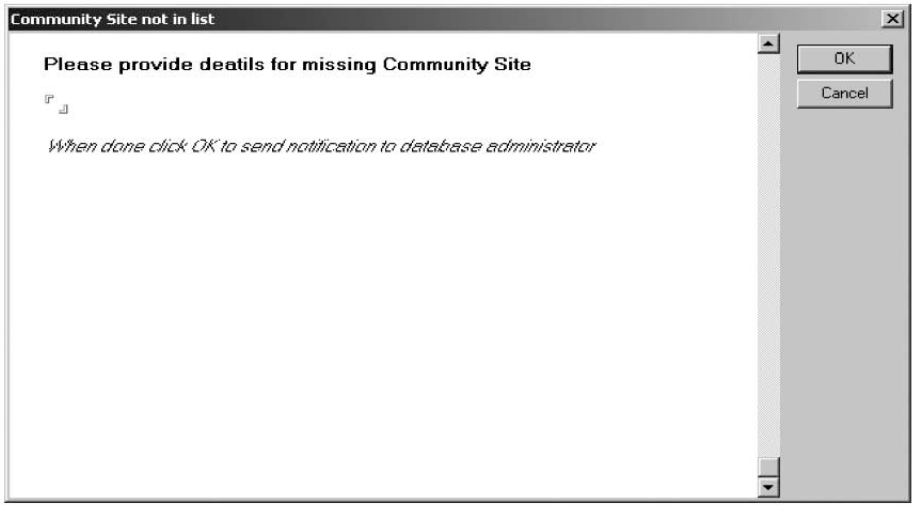
For Pacific and Ontario region, a “Zone” button will appear.
For Community Site, if the name does not appear in the drop down box, pick “Not in list” and click on Database Administrator…


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura... Workspace > Re: W... Water... Water Ma... EHO Ques... EHO Ques... notes
Save Close Delete WS
First Nations Water Management Strategy
2005/2006
Environmental Health Officer (EHO) Questionnaire
Region: Pacific
Name of EHO: Laura Petts
Zone: Coastal
First Nation: Ahousaht
Community Site: Not in list
If Community does not appear on the list, please contact Database Administrator.
Is this community served by at least one
- public facility distribution system, or
- piped distribution system, or
- trucked distribution system?
Yes No
Office

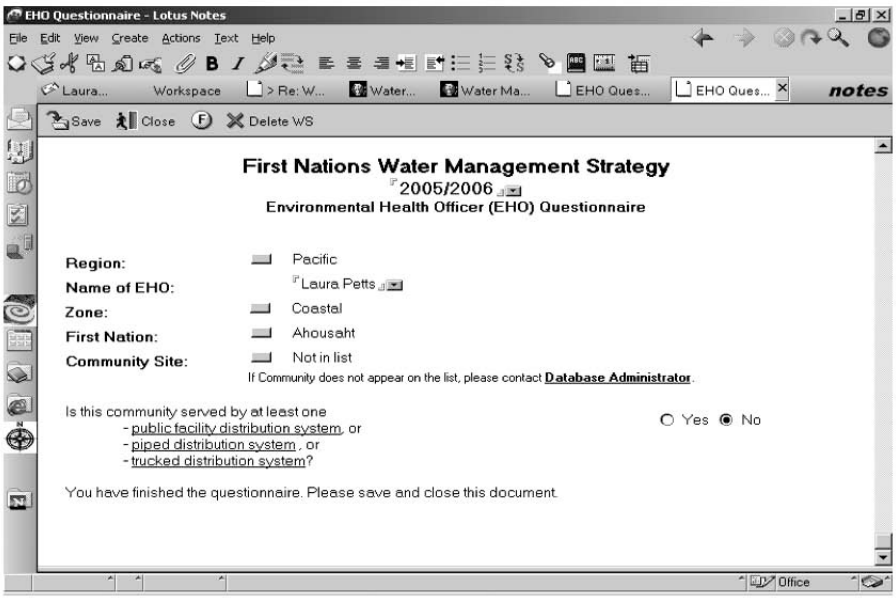
Also, if the name of a Community Site has changed from what appears in the list, please choose the old name, and click on the Database Administrator…


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura... Workspace > Re: W... Water... Water Ma... EHO Ques... EHO Ques... notes
Save Close Delete WS
First Nations Water Management Strategy
2005/2006
Environmental Health Officer (EHO) Questionnaire
Region: Pacific
Name of EHO: Laura Petts
Zone: Coastal
First Nation: Ahousaht
Community Site: Not in list
If Community does not appear on the list, please contact Database Administrator.
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
Office

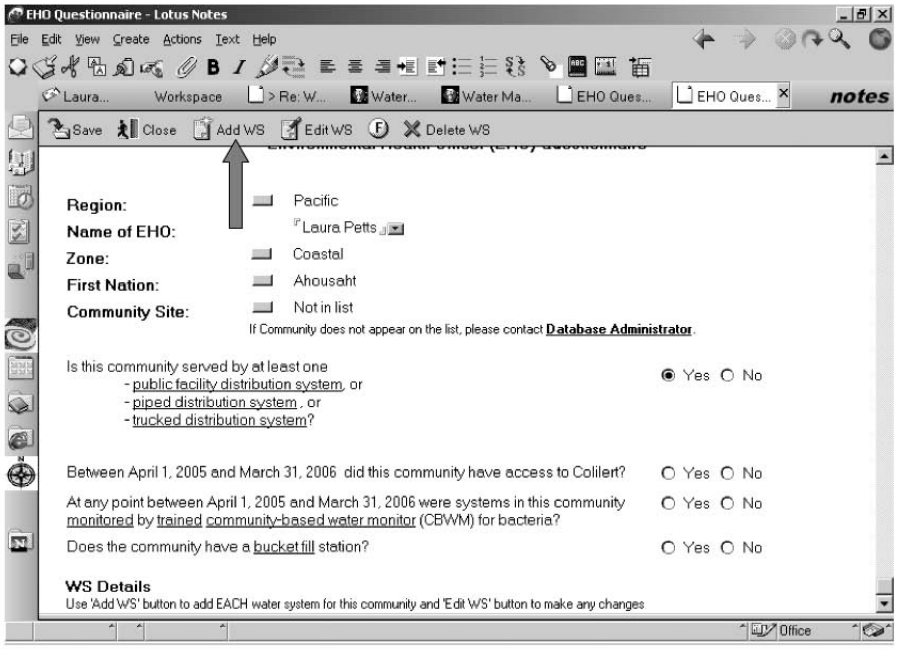
…and, in the pop-up that appears, fill in either the name of the Community Site that is missing or the old and new name for one that has changed. Clicking OK will send the information immediately.


Community Site not in list
Please provide deatils for missing Community Site
When done click OK to send notification to database administrator
OK
Cancel

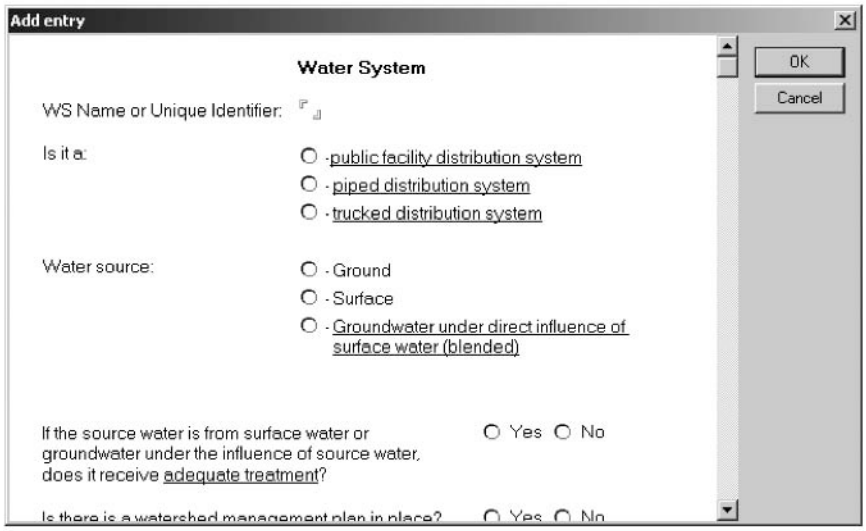
The questionnaire is complete for the community if it is not served by any of the distribution systems listed. Hit Save and Close.


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura... Workspace > Re: W... Water... Water Ma... EHO Ques... EHO Ques... notes
Save Close Delete WS
First Nations Water Management Strategy
2005/2006
Environmental Health Officer (EHO) Questionnaire
Region: Pacific
Name of EHO: Laura Petts
Zone: Coastal
First Nation: Ahousaht
Community Site: Not in list
If Community does not appear on the list, please contact Database Administrator.
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
You have finished the questionnaire. Please save and close this document.
Office

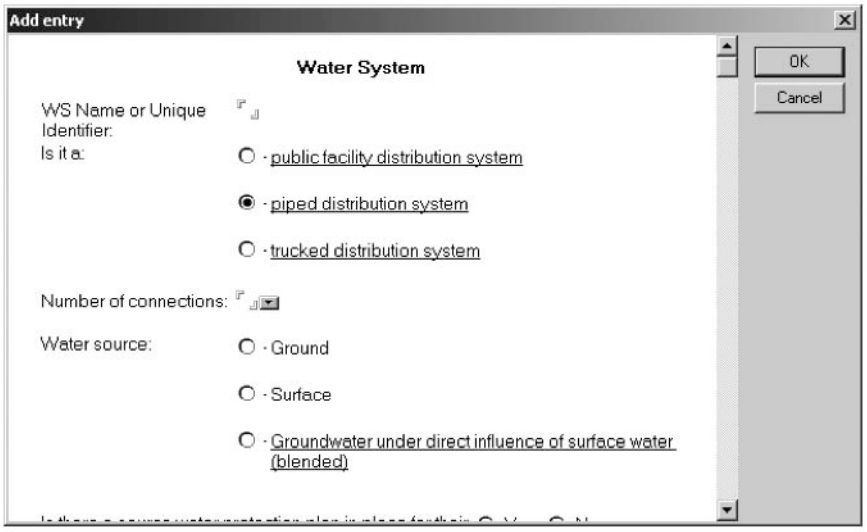
To continue, click on the Add WS (Water System) button on the tool bar


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura... Workspace > Re: W... Water... Water Ma... EHO Ques... EHO Ques... notes
Save Close Add WS Edit WS Delete WS
Region: Pacific
Name of EHO: Laura Petts
Zone: Coastal
First Nation: Ahousaht
Community Site: Not in list
If Community does not appear on the list, please contact Database Administrator.
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
Between April 1, 2005 and March 31, 2006 did this community have access to Colilert? Yes No
At any point between April 1, 2005 and March 31, 2006 were systems in this community monitored by trained community-based water monitor (CBWM) for bacteria? Yes No
Does the community have a bucket fill station? Yes No
WS Details
Use 'Add WS' button to add EACH water system for this community and 'Edit WS' button to make any changes
Office

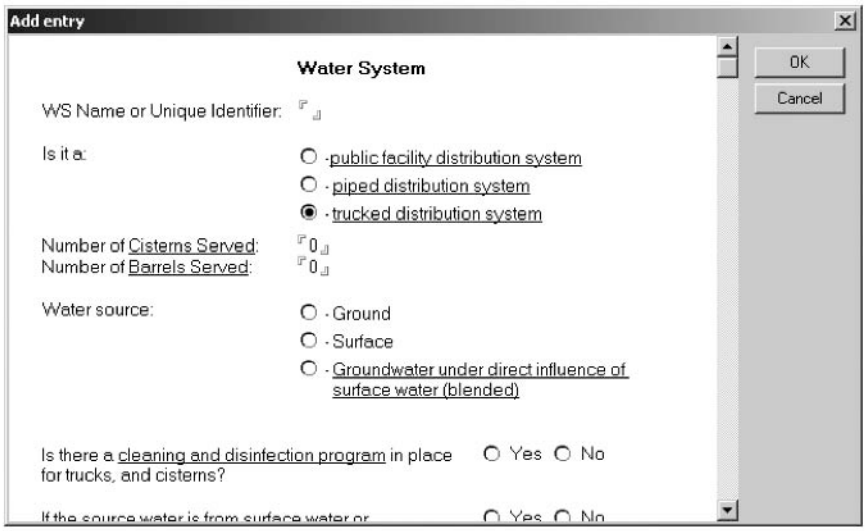
Where the following screen comes up to start entering the water Distribution system information….


Add entry
Water System
OK
Cancel
WS Name or Unique Identifier:
Is it a:
- public facility distribution system
- piped distribution system
- trucked distribution system
Water source:
- Ground
- Surface
- Groundwater under direct influence of surface water (blended)
If the source water is from surface water or groundwater under the influence of source water, does it receive adequate treatment?
Yes
No
Is there is a watershed management plan in place?
Yes
No

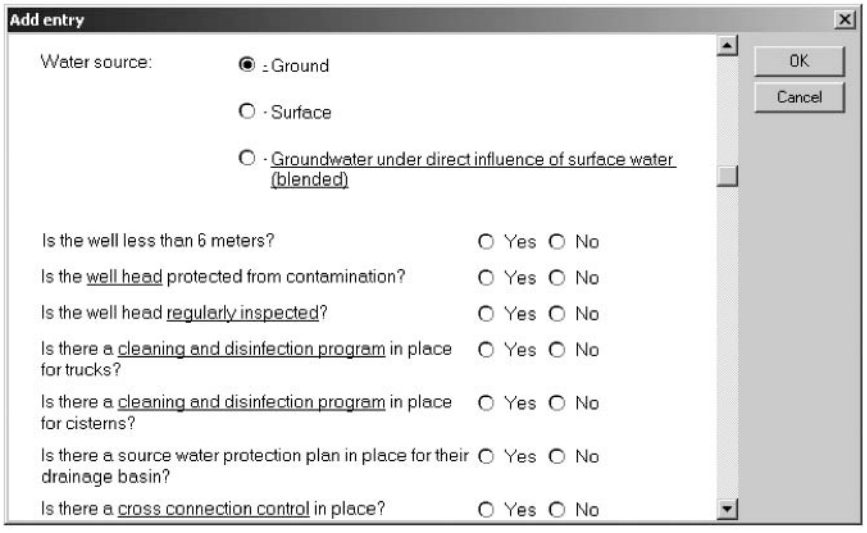
For a piped distribution system, you will be prompted for the number of connections….



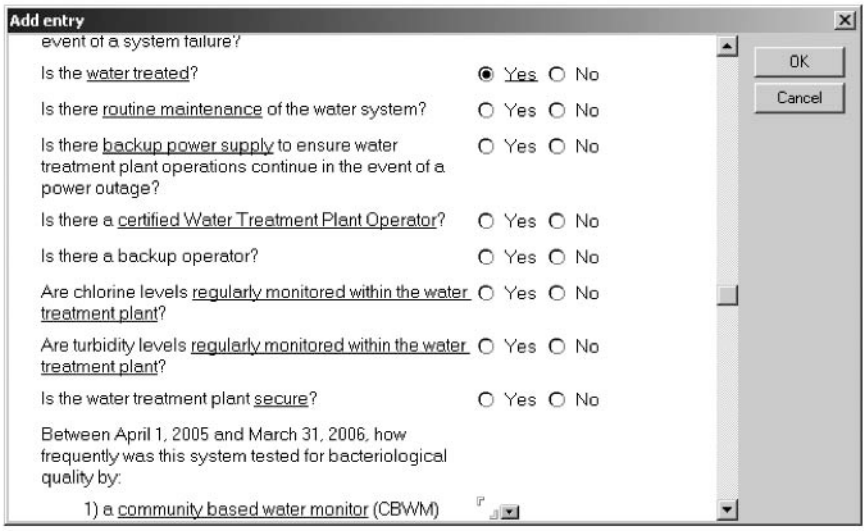
For trucked distribution systems, the numbers of cisterns and Barrels served will be requested. Please note that we are interested in trucked systems serving 5 or more cisterns/barrels


Add entry
Water System
OK
Cancel
WS Name or Unique Identifier:
Is it a:
- public facility distribution system
- piped distribution system
- trucked distribution system
Number of Cisterns Served: 0
Number of Barrels Served: 0
Water source:
- Ground
- Surface
- Groundwater under direct influence of surface water (blended)
Is there a cleaning and disinfection program in place for trucks, and cisterns? Yes No

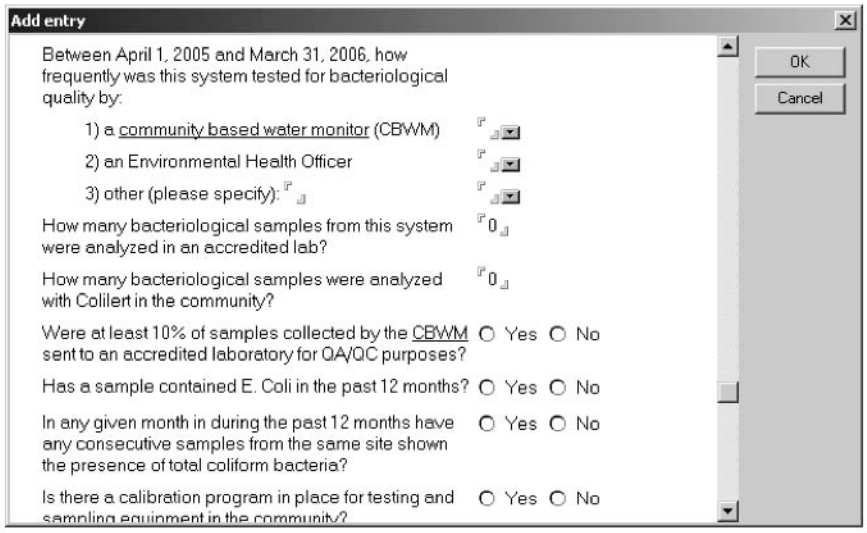
As you go through the questionnaire, additional questions will appear if ground or blended water are the source….


Add entry
OK
Cancel
Water source:
- Ground
- Surface
- Groundwater under direct influence of surface water (blended)
Is the well less than 6 meters? Yes No
Is the well head protected from contamination? Yes No
Is the well head regularly inspected? Yes No
Is there a cleaning and disinfection program in place for trucks? Yes No
Is there a cleaning and disinfection program in place for cisterns? Yes No
Is there a source water protection plan in place for their drainage basin? Yes No
Is there a cross connection control in place? Yes No

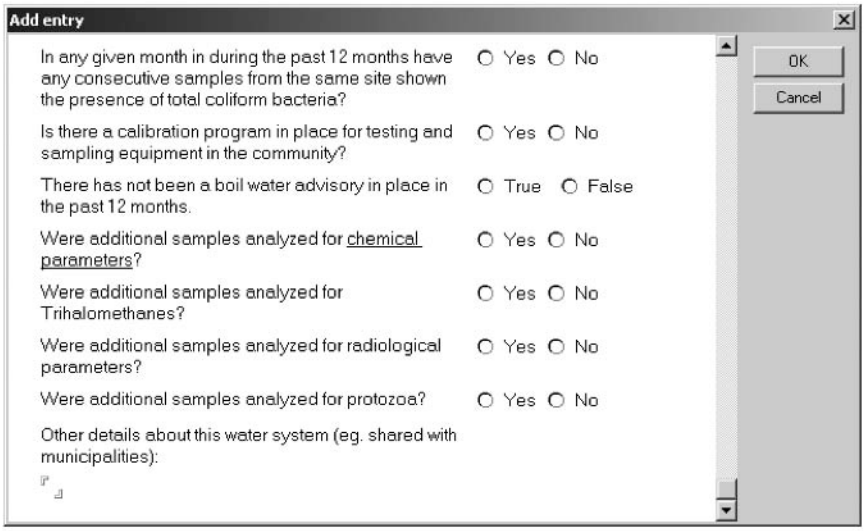
If Yes for "Is the water treated", additional questions will pop up….


Add entry
event of a system failure?
Is the water treated? Yes No
Is there routine maintenance of the water system? Yes No
Is there backup power supply to ensure water treatment plant operations continue in the event of a power outage? Yes No
Is there a certified Water Treatment Plant Operator? Yes No
Is there a backup operator? Yes No
Are chlorine levels regularly monitored within the water treatment plant? Yes No
Are turbidity levels regularly monitored within the water treatment plant? Yes No
Is the water treatment plant secure? Yes No
Between April 1, 2005 and March 31, 2006, how frequently was this system tested for bacteriological quality by:
1) a community based water monitor (CBWM)
OK
Cancel

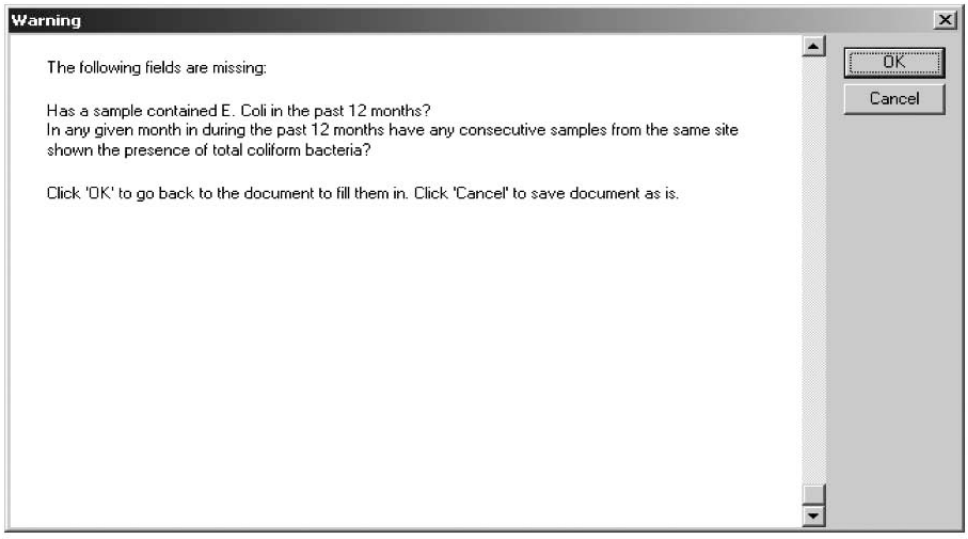
Scrolling down, the following questions appear…


Add entry
Between April 1, 2005 and March 31, 2006, how frequently was this system tested for bacteriological quality by:
1) a community based water monitor (CBWM)
2) an Environmental Health Officer
3) other (please specify):
How many bacteriological samples from this system were analyzed in an accredited lab? 0
How many bacteriological samples were analyzed with Colilert in the community? 0
Were at least 10% of samples collected by the CBWM sent to an accredited laboratory for QA/QC purposes? Yes No
Has a sample contained E. Coli in the past 12 months? Yes No
In any given month in during the past 12 months have any consecutive samples from the same site shown the presence of total coliform bacteria? Yes No
Is there a calibration program in place for testing and sampling equipment in the community? Yes No
OK
Cancel

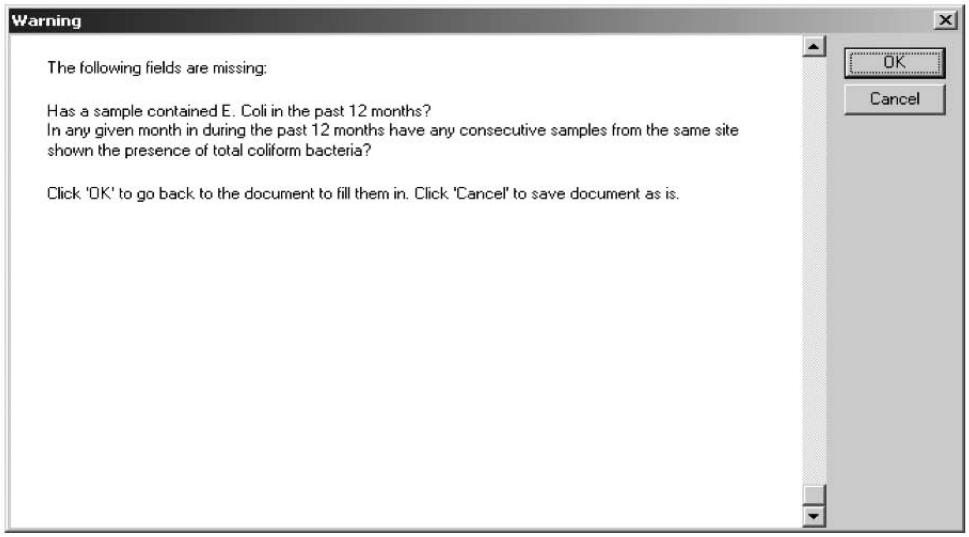
When you have finished answering the questions, click on OK…


Add entry
In any given month in during the past 12 months have any consecutive samples from the same site shown the presence of total coliform bacteria?
Yes No
Is there a calibration program in place for testing and sampling equipment in the community?
Yes No
There has not been a boil water advisory in place in the past 12 months.
True False
Were additional samples analyzed for chemical parameters?
Yes No
Were additional samples analyzed for Trihalomethanes?
Yes No
Were additional samples analyzed for radiological parameters?
Yes No
Were additional samples analyzed for protozoa?
Yes No
Other details about this water system (eg. shared with municipalities):
OK
Cancel

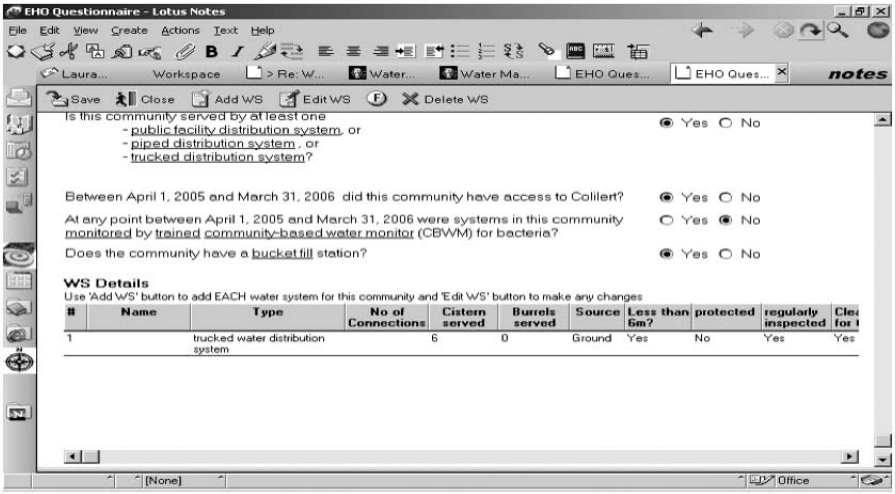
If any of the fields were not filled in, the following message will appear. If you can fill in information asked for, hit OK which will bring you back to the Water System page where you can provide the answers.


Warning
The following fields are missing:
Has a sample contained E. Coli in the past 12 months?
In any given month in during the past 12 months have any consecutive samples from the same site shown the presence of total coliform bacteria?
Click 'OK' to go back to the document to fill them in. Click 'Cancel' to save document as is.
OK
Cancel

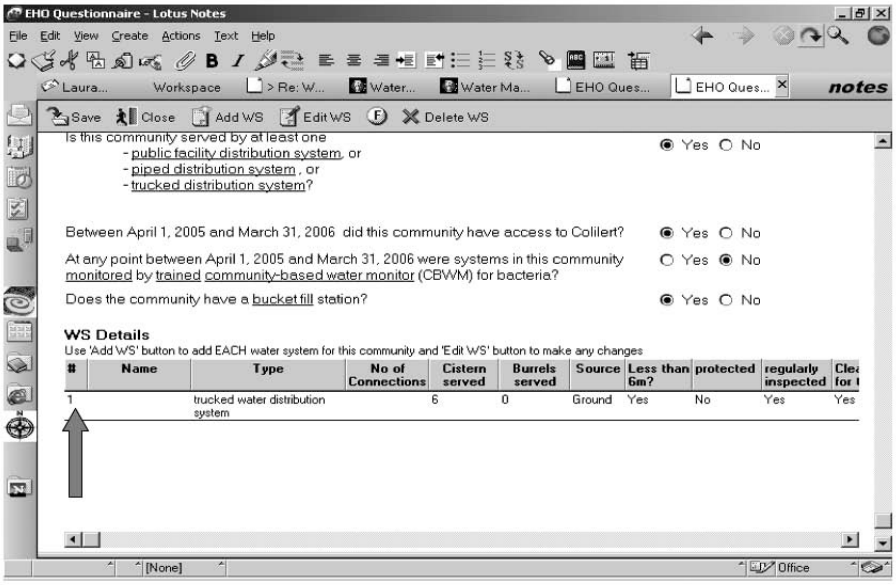
Otherwise, if you cannot provide the information required, or have provided all the information that you have, hit cancel……


Warning
The following fields are missing:
Has a sample contained E. Coli in the past 12 months?
In any given month in during the past 12 months have any consecutive samples from the same site shown the presence of total coliform bacteria?
Click 'OK' to go back to the document to fill them in. Click 'Cancel' to save document as is.
OK
Cancel

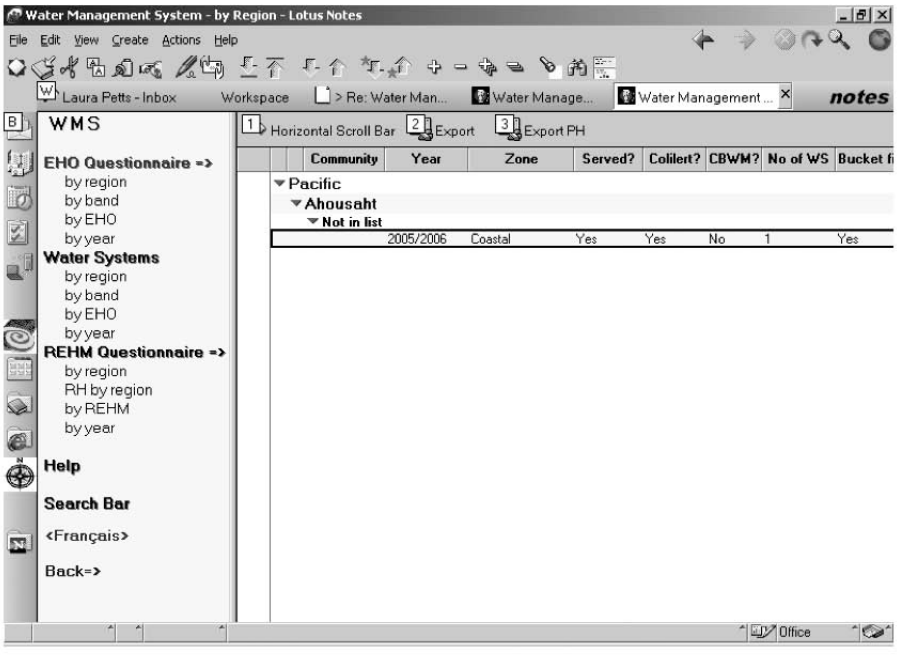
..which will bring you back to the community screen, with some detail on the WS listed. If there are more water systems, click on “Add WS” and continue with the detail for each system. If you need to change information, click “Edit WS”. This will prompt you for the WS number, which in the following example is the “1” in the left hand column of the Water System information.


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Save Close Add WS Edit WS Delete WS
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
Between April 1, 2005 and March 31, 2006 did this community have access to Colilert?
At any point between April 1, 2005 and March 31, 2006 were systems in this community monitored by trained community-based water monitor (CBWM) for bacteria?
Does the community have a bucket fill station?
WS Details
Use 'Add WS' button to add EACH water system for this community and 'Edit WS' button to make any changes
Name Type No of Connections Cistern served Barrels served Source Less than 6m? protected regularly inspected
1 trucked water distribution system 6 0 Ground Yes No Yes Yes

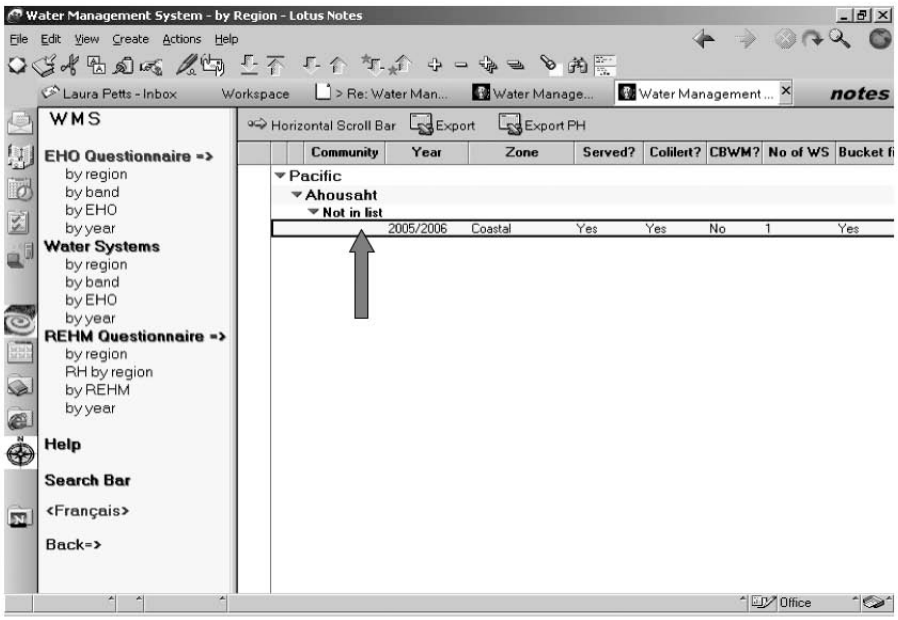
When finished the water distribution systems for a community site, click on Save and Close.


EHO Questionnaire - Lotus Notes
File Edit View Create Actions Text Help
Laura... Workspace > Re: W... Water... Water Ma... EHO Ques... EHO Ques... notes
Save Close Add WS Edit WS Delete WS
Is this community served by at least one
- public facility distribution system, or
- piped distribution system , or
- trucked distribution system?
Yes No
Between April 1, 2005 and March 31, 2006 did this community have access to Colilert? Yes No
At any point between April 1, 2005 and March 31, 2006 were systems in this community monitored by trained community-based water monitor (CBWM) for bacteria? Yes No
Does the community have a bucket fill station? Yes No
WS Details
Use 'Add WS' button to add EACH water system for this community and 'Edit WS' button to make any changes
Name Type No of Connections Cistern served Barrels served Source Less than 6m? protected regularly inspected
1 trucked water distribution system 6 0 Ground Yes No Yes Yes
[None]
Office

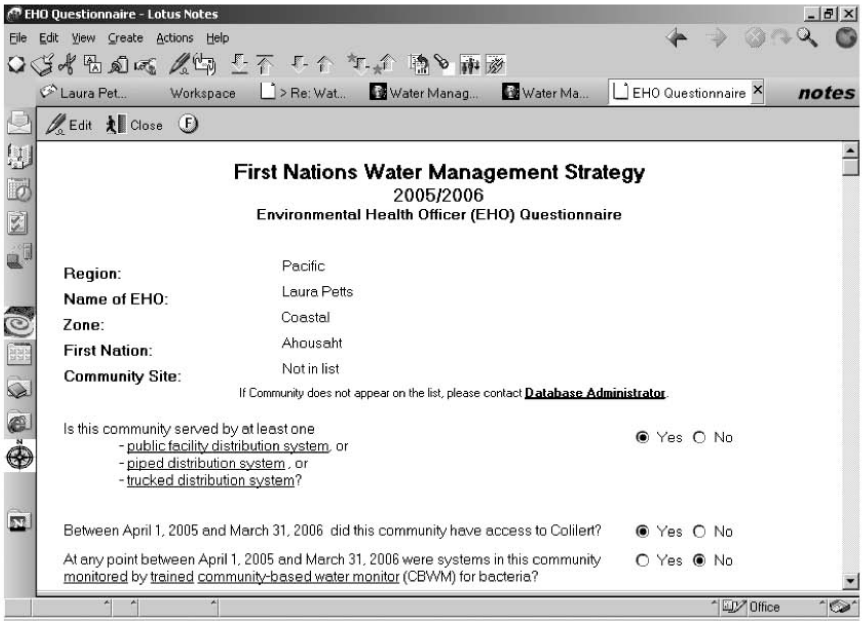
Which will bring you back to the main screen. To enter the next community click on EHO Questionnaire again.



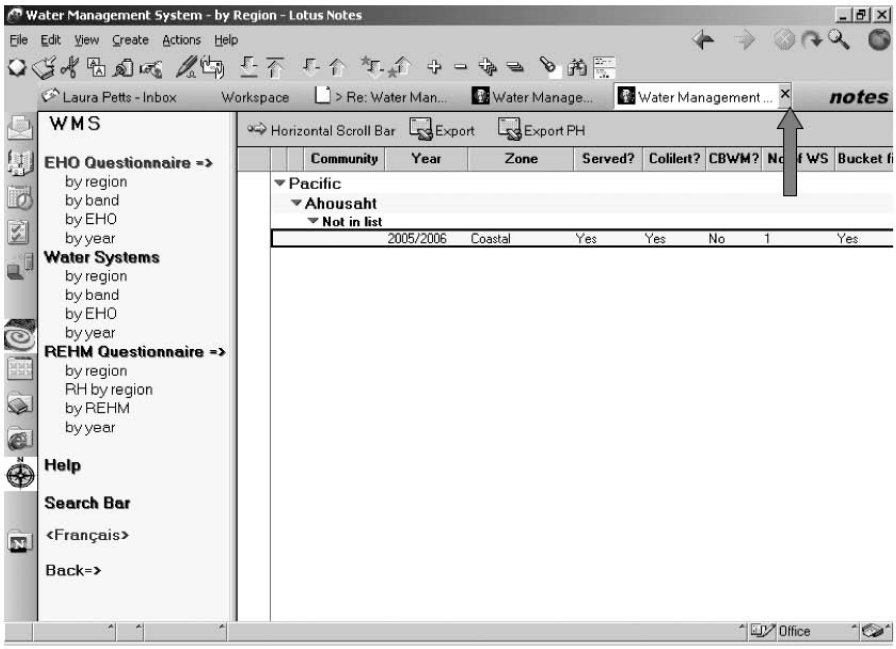
If you want to go back in and edit a Water Distribution System or add one to a community, simply go to one of the water systems that are entered And click twice on it. That will bring up the record.



Please note that only the database administrator can delete a record. If you Need to have a Water System deleted, change the name of the WS to DELETE and e-mail Laura_petts@hc-sc.gc.ca to ensure it is taken out.

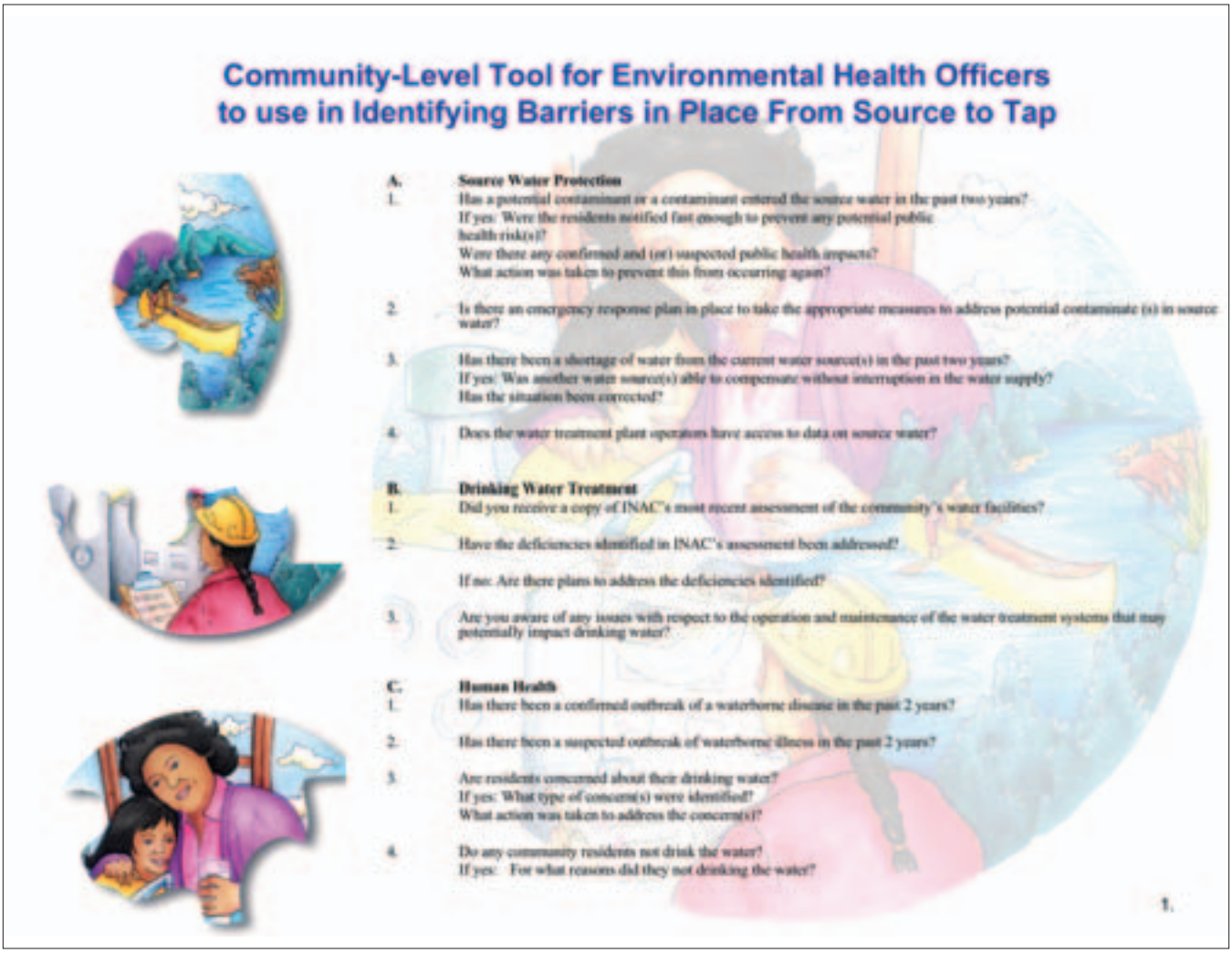


Once you have finished, just click on the “X” buttons beside the database name.



10.3 Community-Level Tool for Environmental Health Officers to Use in Identifying Barriers in Place From Source To Tap

The following presentation and graphics are available upon request through the Environmental Health Division.


Community-Level Tool for Environmental Health Officers
to use in Identifying Barriers in Place From Source to Tap
A. Source Water Protection
1. Has a potential contaminant or a contaminant entered the source water in the past two years?
If yes: Were the residents notified fast enough to prevent any potential public health risk(s)?
Were there any confirmed and (or) suspected public health impacts?
What action was taken to prevent this from occurring again?
2. Is there an emergency response plan in place to take the appropriate measures to address potential contaminate (s) in source water?
3. Has there been a shortage of water from the current water source(s) in the past two years?
If yes: Was another water source(s) able to compensate without interruption in the water supply?
Has the situation been corrected?
4. Does the water treatment plant operators have access to data on source water?
B. Drinking Water Treatment
1. Did you receive a copy of INAC's most recent assessment of the community's water facilities?
2. Have the deficiencies identified in INAC's assessment been addressed?
If no: Are there plans to address the deficiencies identified?
3. Are you aware of any issues with respect to the operation and maintenance of the water treatment systems that may potentially impact drinking water?
C. Human Health
1. Has there been a confirmed outbreak of a waterborne disease in the past 2 years?
2. Has there been a suspected outbreak of waterborne illness in the past 2 years?
3. Are residents concerned about their drinking water?
If yes: What type of concern(s) were identified?
What action was taken to address the concern(s)?
4. Do any community residents not drink the water?
If yes: For what reasons did they not drinking the water?
1.

Community-Level Tool for Environmental Health Officers to use in Identifying Barriers in Place From Source to Tap

D. Drinking Water Distribution Systems

1. What percentage of houses in the community have access to potable water through: piped system (5 or more connections) and system with 2-4 connections inclusive, cisterns, private wells, bucket fill, or bottle fill

2. What percentage do not have access to potable water at the tap?

3. Does the drinking water quality meet the Canadian *Guidelines for Drinking Water Quality*?

4. Over the past year have there been any complaints over the quantity of potable water?

6. Has there been a shortage of drinking water in the past two years?
   If yes, Was drinking water provided without any gaps in service?

7. Is there sufficient water quantity being provided to residents (min 180L per capita per day, *Design Standards, Levels of Service Standard: Water and Sewage Systems, INAC's Corporate Manuals System*) ?

8. Is drinking water quality monitoring over a 12 month period as per frequencies detailed in HC's *Procedure Manual for Drinking Water Quality Monitoring in First Nations Communities South of 60* for:
   - E. coli - turbidity - chlorine - routine and baseline chemical parameters

9. Are chlorine residuals monitored throughout the system?

10. Has a Boil Water Advisory (BWA) been issued at anytime over the past two years? If yes, what was the longest it has been in place?
    - No BWA for past 2 years - < 1 week - < one month - < 6 months - < 12 months - <1-2 years - > 2 years

    How many cumulative days has it been in place over the past two years?
    - No BWA for past 2 years - < 1 week - < one month - < 6 months - < 12 months - <1-2 years - > 2 years

11. Has the community been advised to not drink the water due to potential public health risk(s) from physical, chemical and/or radiological contaminants over the past two years?
    If yes: How many times did this occur?

12. Is there a notification process in place in the event of a problem with drinking water quality and/or quantity?

2.

11 Review of Proposals for Water and Wastewater System Projects

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Health Canada – First Nations and Inuit Health Branch Guidelines for the Review of Water and Wastewater Project Proposals in First Nations Communities South of 60° . . . 11.2.1

11.1 Roles and Responsibilities for the Review Process

Health Canada's role is to review proposals for water and wastewater system projects to determine whether adequate measures will be taken to prevent, correct, or mitigate any factors that could threaten public health and to ensure proposed facilities will produce drinking water that meets the *Guidelines for Canadian Drinking Water Quality (GCDWQ)*.

Indian and Northern Affairs Canada (INAC) is responsible for approving funding for water and wastewater system projects. Public Works and Government Services Canada (PWGSC) client services provide professional and technical advice to INAC for the project review. INAC/PWGSC's role is to ensure that project proposals meet appropriate engineering standards, guidelines, and policies.

Environment Canada's role is to review proposals for water and wastewater system projects to determine if adequate measures will be taken to prevent any factors that could threaten the environment and to ensure projects will meet relevant federal regulatory requirements such as the *Canadian Environment Assessment Act (CEAA)*.

First Nations, as project proponents, will make their final decision at each stage of the project and clearly identify record and make accessible to the reviewers any changes to the project's scope or the design elements of previously approved stages.

For more detailed information on roles and responsibilities, refer to the *National Framework for the Review Process of Water and Wastewater Systems in First Nations Communities* published by the Government of Canada in March 2005.

11.2 Health Canada – First Nations and Inuit Health Branch Guidelines for the Review of Water and Wastewater Project Proposals in First Nations Communities South of 60°

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Acknowledgements

The publication and distribution of *Health Canada's First Nations and Inuit Health Branch Guidelines for Review of Water and Wastewater Project Proposals in First Nations Communities South of 60°* is possible because of the commitment and dedicated work of:

Health Canada working group members:

- Brian R. Morrison, Health Canada, First Nations and Inuit Health Branch, Atlantic Region
- Skattar Sandhu, Health Canada, First Nations and Inuit Health Branch, Alberta Region
- Susan Talbot, Health Canada, First Nations and Inuit Health Branch, Atlantic Region

In addition, we extend special thanks to Dr. Dan Smith of the University of Alberta, and David Atkins, P. Eng., Indian and Northern Affairs Canada, for providing input in the development of this document.

Public Health Engineering Section, Secretariat to the Working Group:

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- Clara Bryna Heffernan, Health Canada, First Nations and Inuit Health Branch, HQ
- Jacinthe A. Séguin, Health Canada, First Nations and Inuit Health Branch, HQ

Executive Summary

The *Guidelines for Review of Water and Wastewater Project Proposals in First Nations Communities South of 60°* (the Guidelines) were developed by representatives from Health Canada's (HC) First Nations and Inuit Health Branch (FNIHB) Environmental Health Services from the Alberta and Atlantic regions as well as from FNIHB Headquarters (HQ).

This document was created following the development of the *National Framework for the Review Process of Water and Wastewater Systems in First Nations Communities* (the Framework) to assist FNIHB regional offices in their review of project proposals.

The Guidelines are a step-by-step guide for Environmental Health Officers (EHOs) and Public Health Engineers (PHEs) to review project proposals from a public health perspective. They provide elements to be considered for the review process, procedures on how to carry out the review, essential documentation to be provided at each stage of the review, roles and responsibilities of EHOs and PHEs and finally, the coordination of the review process.

The Guidelines are a living document and will be updated, as necessary.

1.0 Framework Agreement

The *National Framework for the Review Process of Water and Wastewater Systems in First Nations Communities, March 2005*, (the Framework) was created in response to the First Nations Water Management Strategy (FNWMS). The Framework is a joint effort of Indian and Northern Affairs Canada (INAC), Environment Canada (EC) and Health Canada (HC). It outlines an integrated review process for drinking water and wastewater infrastructure projects along with the roles and responsibilities of the four departments.

The main objective of the integrated review process is to ensure that all project proposals are reviewed in a coordinated fashion by all involved departments at the various stages of their development to help First Nations meet relevant standards and guidelines. The Framework is intended to complement existing review processes in use in regions, by clarifying communications and implementation protocol.

Appendix 3 of the Framework defines review elements for consideration by each involved department. The INAC list is comprehensive and ensures that the project proposals meet appropriate engineering standards, guidelines and policies, including Level of Service Standards (LOSS) and industry acceptable standards, that the estimated costs are reasonable, and that the proposed system can meet the project objectives within an acceptable time period. Environment Canada's role is to review proposals for potential environmental impacts.

Health Canada's mandate and elements for review are addressed in these Guidelines.

2.0 Purpose of Guidelines

The purpose of the Guidelines is to provide a step-by-step guide for Health Canada First Nations and Inuit Health Branch (FNIHB) regional reviewers, both Environmental Health Officers (EHO) and Public Health Engineers (PHE), to review projects from a public health perspective. This document outlines elements to be considered for the review process, procedures for carrying out the review, essential documentation to be provided at each stage of the review and roles of the EHO and the PHE, including coordination of the review process.

3.0 Health Canada Mandate

Health Canada's general mandate, as defined in the *Department of Health Act, 1996*, includes coordinating efforts to preserve and improve public health. The scope of the review by Health Canada, therefore, will be defined by those elements associated with protecting public health.

For water servicing projects, these elements include an assessment of the following global aspects:

- Drinking water quality meets *Guidelines for Canadian Drinking Water Quality (GCDWQ)* and provincial standards as applicable.
- Quantity of drinking water sufficient to meet present and future community needs.
- Reliability of the supply of safe drinking water on a continuous basis.

For wastewater servicing projects, the review focus includes an assessment of aspects such as the location of both the outfall and sludge disposal facilities and proximity to other uses, as well as site security as it affects public health and safety.

4.0 Role of Environmental Health Officer and Public Health Engineer

The roles of the EHO, and the PHE when engaged, are outlined in three parts:

Part 1
Determine if the process used by the system designer identified the main health and epidemiological-related risk factors to be addressed by:

i) Source water protection area

ii) Threats to water source

iii) Water monitoring protocols

iv) Wastewater effluent discharge – quality and location

Part 2
Based on experience with similar installations and in the context of the available raw water source, can the proposed system realistically meet the designer's performance claims by delivering drinking water that is safe, and by delivering it continuously and reliably in a First Nations environment?

In addition, if there were risk factors identified by the designer in Part 1, what pre-design work (e.g. literature reviews, bench-scale testing, pilot-plant testing) was completed to ensure that the design assumptions adopted to address all identified risk factors were correct?

Part 3
Do the performance claims for the proposed drinking water system meet or exceed Health Canada's requirements for drinking water quality?

4.1 Environmental Health Officer

The EHO is responsible for the coordination of the review process on behalf of HC (FNIHB). The EHO brings on-the-ground experience to the review process as well as familiarity with the site, local conditions and community. If required, and on a case-by-case basis, the EHO will engage a PHE to review specific aspects of a project from a public health perspective.

4.2 Public Health Engineer

At the request of an EHO, the PHE will undertake the technical review of a given project from a public health perspective, in accordance with the three-part approach outlined above.

5.0 Review Process

As summarized in the Framework, reviews may take place during each of the following three stages of the development of a proposed project:

- Feasibility
- Pre-Design
- Design

INAC serves as the single point of contact for First Nations submitting proposals. HC and other stakeholders will receive projects for review from INAC. The EHO is responsible for the coordination of the review process on behalf of HC. It is the responsibility of the EHO to identify clearly which items of the review the EHO will cover and which will be delegated to a PHE or other designated reviewer.

A list of minimum essential documentation to be provided by project proponents at each stage of the review process is presented in Appendix A of this report.

6.0 Elements for Review

The submission review process will proceed on a step-by-step basis through interrelated sub-components that together comprise the overall proposed water or wastewater servicing project. These sub-components are called Elements for Review. Each element focuses on the assessment of a specific aspect of the project.

The number of elements in a given project submission will vary depending on the scope and intent of the development initiative. Not all project submissions will require a review of each of the elements listed below. The types of elements vary between water servicing and wastewater servicing projects with only minor overlap.

For each development initiative, the following Elements for Review should be listed and deemed applicable as a minimum in the review process:

1. Individual responsible for review
2. Applicable provincial/federal standard/ regulation/guideline or alternative (e.g. *Ten States Standards*, best practices)
3. Confirmation of use of standards in design
4. List of exceptions to the implementation of the standards

Form A of Appendix B provides an organizational tool for the Health Canada EHO to establish the submission review process and document its progress.

Form B of Appendix B is a tool for the Health Canada reviewers to document their findings in the review process.

The details associated with each element peraining to either water servicing or wastewater servicing projects are outlined in Appendices D and E. An overview of the issues associated with the Elements for Review is listed below:

6.1 Water Servicing Projects

The overall objective is to protect public health by ensuring the proposed system is sufficient to provide an adequate, safe and reliable water supply that meets *Guidelines for Canadian Drinking Water Quality* (latest edition) and provincial quality guidelines/standards as applicable.

Although it is expected that project reviews at all stages will address these areas, during the feasibility stage greater emphasis ought to be

placed on source, supply and treatment areas, including a detailed assessment of all viable alternatives considered by the project proponent.

At the design stage, project reviews generally will include greater emphasis on details regarding treatment, disinfection practices, monitoring, integrity and security, filter backwash water management and the specifics of the buried infrastructure distribution system.

6.1.1 Drinking Water Source

The areas to be examined as part of the Drinking Water Source element assessment include:

- Source vulnerability
- Source protection
- Raw water characterization:
  - Chemical, physical, radiological, microbiological
  - Is sampling representative? Is seasonal sampling required?

The step-by-step procedures associated with carrying out the Drinking Water Source element review are presented in Appendix D, under the title "Water Servicing Project Review Elements."

6.1.2 Water Treatment

The areas to be examined as part of the Water Treatment processes and systems include:

- Need for a pilot project
- Suitability to raw water quality
- Ability to meet GCDWQ and provincial quality guidelines
- Water production protocols
- Treatment additive compatibilities

The step-by-step procedures associated with carrying out the Water Treatment processes and systems element review are presented in Appendix D, under the title "Water Servicing Project Review Elements."

6.1.3 Disinfection

The areas to be examined as part of the Disinfection and disinfection by-products are indicated in the following points:

- Treated water clearwell:
  - CT (concentration time) disinfection concept
    - Clearwell size
    - Baffling mechanisms
- Microbiological inactivation:
  - Removal/inactivation efficiency for Giardia pathogens
  - Removal/inactivation efficiency for Cryptosporidium pathogens
  - Removal/inactivation efficiency for viruses
- Microbiological inactivation ratings for treatment processes and systems
- Determination of design chlorine residual to be maintained
- Location of disinfection dosage points

- Consideration for a disinfectant (primary and secondary disinfection) as well as the potential for formation of disinfection by-products

6.1.4 Monitoring and Alarms

The areas to be examined as part of the element called Monitoring and Alarms include:

- Automatic on-line monitoring systems:
  - Turbidity levels and particle count
  - PH levels
  - Residual chlorine levels
- Sampling points for raw and treated water, access and protocols
- Alarm supervision systems, protocols and settings

6.1.5 Water Treatment Facility Integrity and Security

The areas to be examined as part of Water Treatment Facility Integrity (cross-connection control) and Security include:

- Protection of treated water supply
- Raised hatches and sealed openings in reservoir
- Containment for fuel and chemical storage
- Fencing and building security
- Provision of standby power

6.1.6 Distribution System

The areas to be examined as part of the Distribution System element include:

- Identification of potential cross-connections and level of cross-connection protection
- Dead-ends and stagnation potential:
  - Flush points
  - Disinfection boosting systems
- Holding tank systems

6.2 Wastewater Servicing Projects

The overall objective is to protect public health by ensuring that proposed wastewater servicing systems minimize adverse impacts on all water use practices, including drinking water and recreational development.

It is expected that the review of projects in all stages of an initiative's development will address the objectives of reducing the negative impact on water use practices.

At the design stage, project reviews will include greater emphasis on details regarding effluent quality and location, cross-connection control in the plant and security measures.

6.2.1 Effluent Discharge

The areas to be examined as part of the Effluent Discharge system include:

- Location, frequency of discharge and appropriate effluent discharge criteria relative to impact on public use
- Location of sludge disposal and potential impact on public health
- Set-back compliance
- Receiving water body:
  - Water levels
  - Flow data
  - Assimilative capacity

6.2.2 Integrity and Security

The areas to be examined as part of the Integrity and Security of the treatment system include:

- Fencing of lagoons and open tankage
- Set-back compliance
- Cross-contamination
- Overflow mechanisms and related discharge protocols

Appendix A:
List of Minimum Essential Review Package Submission Documents

1.0 Minimum Essential Review Package Submission Documents

1.1 Water Servicing Projects

1.1.1 Feasibility Study Stage

- Feasibility Study Report:
  - Development of contemplated design criteria
  - Evaluation of all available alternatives:
    - For each source option:
      - Delineation of watershed area
      - Evaluation of vulnerability to contamination
      - Evaluation of adequacy of quantity of supply
      - Raw water quality data
    - For each treatment option:
      - Matched to water source characteristics
  - Distribution

1.1.2 Pre-Design Stage

- Pre-Design Report/Design Brief:
  - Detailed development of recommended option including:
    - Evaluation of adequacy of quantity of supply
    - Detailed evaluation of treatment option including:
      - Results of a pilot project
      - Design guidelines to be followed
      - Design discussions including disinfection methods
    - Detailed raw water quality data:
      - Physical, chemical, radiological and microbiological
      - Seasonal data
- Environmental Screening Report

1.1.3 Detailed Design Stage

- Drawings and specifications for review by PHE
- Monitoring plan
- Information on system integrity
- Treatment processes, method of disinfection and type of disinfectant, other chemical additives, determination to ensure adequate contact time (CT) for log reduction of crypto, Giardia and viruses, etc.

1.2 Wastewater Servicing Projects

1.2.1 Feasibility Study Stage

- Review of proposed locations of facilities
- Review of surrounding land use
- Information on the effluent quality

1.2.2 Pre-Design Stage

- Location of proposed discharge
- Detailed land-use mapping
- Proposed effluent discharge criteria
- Proposed set-back criteria
- Proposed method of sludge disposal

1.2.3 Detailed Design Stage

- Detailed drawings and specifications for review by PHE
- Discharge location, frequency of discharge and effluent criteria
- Proposed method of sludge disposal
- Set-back distances
- Fencing and other security measures

Appendix B:
Submission Review Process Tracking Forms

Form A: Review Process – Assignment of Responsibility

First Nation Band Name: _____

First Nation Community: _____

Project: _____

Stage: _____

Date Submitted: _____

Environmental Health Officer: _____

Water Servicing Projects				
Review Element	**Responsibility**	**Assigned Reviewer**	**Date Commenced**	**Date Completed**
Source				
Quantity of Supply				
Treatment				
Disinfection				
Monitoring and Alarms				
Integrity and Security				
Distribution				

Wastewater Servicing Projects				
Review Element	**Responsibility**	**Assigned Reviewer**	**Date Commenced**	**Date Completed**
Location of discharge				
Effluent discharge criteria				
Location of sludge disposal				
Set-back compliance				
Fencing enclosures				

Form B: Review Process – Element Assessment Results

First Nation Band Name _____ Date Submitted _____

Project _____ Stage _____

Environmental Health Officer _____

Element for Review _____

Standards/Guidelines Applied _____

_____

_____

Exceptions

Form B: Review Process – Element Assessment Results

Comments

Resolution

Appendix C:
List of Relevant Guidelines and Standards

1. *Health Canada Guidelines for Canadian Drinking Water Quality* (latest version)
   http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/doc_sup-appui/sum_guide-res_recom/index_e.html

2. *Health Canada Guidelines for Canadian Recreational Water Quality* (latest version)
   http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/guide_water-1992-guide_eau_e.html

3. *Protocol for Safe Drinking Water in First Nations Communities*, published by Indian and Northern Affairs Canada (INAC), March 2006

4. *Health Canada's Procedure Manual for Safe Drinking Water in Canada's First Nations Communities South of 60°*, available at Health Canada, First Nations and Inuit Health Branch regional offices

5. *Environment Canada Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments, 1976*
   http://www.ec.gc.ca/etad/default.asp?lang=En&n=023194F5-1

6. Indian and Northern Affairs Canada
   Corporate Manuals System
   Volume 1 – Capital Facilities and Maintenance, Water and Sewage Systems
   Technical Information Document – Community Water Systems
   Protocol for Safe Drinking Water in First Nations Communities
   http://www.tbs-sct.gc.ca/rma/eppi-ibdrp/hrdb-rhbd/fnwms-sgepn/description_e.asp

7. Applicable Provincial Regulations Standards – Links to provincial websites

   Alberta
   http://www.gov.ab.ca/home/index.cfm?page=5

   BC
   http://www.gov.bc.ca/bvprd/bc/home.do

   Manitoba
   http://www.gov.mb.ca/departments.html

   New Brunswick
   http://app.infoaa.7700.gnb.ca/gnb/pub/search1.asp

Newfoundland
http://www.health.gov.nl.ca/health/divisions/medical/diseasecontrol.htm

Nova Scotia
http://www.gov.ns.ca/gov_index.asp

Ontario
http://www.infogo.gov.on.ca/infogo/mainPage.do

PEI
http://www.gov.pe.ca/phone/index.php3

Quebec
http://www.gouv.qc.ca/catchall_en.html

Saskatchewan
http://www.gov.sk.ca/deptsorgs/

Ten States Standards

Recommended Standards for Waterworks (latest edition)
http://www.rpi.edu/dept/chem-eng/Biotech-Environ/IONEX/tenstatestds.html
and
http://www.dutchessny.gov/countygov/Departments/Health/Reports/HD10StatePreface.pdf

National Sanitation Foundation (NSF)

NSF Standard 60 – Drinking Water Treatment Chemicals, Health Effects
NSF Standard 61 – Drinking Water System Components, Health Effects
http://www.nsf.org/consumer/drinking_water/index.asp?program=WaterTre

Appendix D:
Water Servicing Project Review Elements

WATER SERVICING PROJECT

ELEMENT: Drinking Water Source – Feasibility stage

Project Stage: *Feasibility Study*

Aim of Review: *Assess the contamination vulnerability and security of the proposed drinking water source and highlight concerns that will need to be addressed during design and subsequent stages of a proposal's development.*

Reviewer: *Environmental Health Officer (EHO)*

Review Focus and Issues Identification:

Source Water Protection Area

For the proposed drinking water source, has the area of source water been delineated by the proponent within the feasibility study submission? Items to consider in making such assessments include:

i) The first step in protecting a drinking water source is to identify the source area that provides water for either a surface water source or a well. In all cases, the initial source of water is precipitation. The route that precipitation follows to get to the drinking water source is most important. After rain falls on the Earth's surface, it either runs off as surface water or infiltrates the ground to become groundwater. Surface-related activities have impacts on both surface and groundwater.

ii) The key question when assessing the area of a surface watershed is: "If a drop of water falls on an area, where will it go?" For larger watersheds, judgment is required to determine the area of significant impact. Is the proposal's judgment in such cases considered satisfactory?

Potential Threats to Water Source

With regard to the EHO's first-hand knowledge of the community, determine whether both known and suspected conditions of source water contamination have been addressed in the feasibility study.

i) Has a watershed evaluation been conducted for potential contamination from industry, agriculture and municipal sources that could affect required treatment for water treatment facilities?

Within the delineation of the source area presented by the feasibility study submission, identify high-risk activities and land uses, and identify whether each has been addressed in the study. These may include:

i) Local and neighbouring landfill sites – hazardous waste, municipal waste and private disposal;
ii) Known locations of groundwater contamination with industrial by-products;
iii) Existing or abandoned commercial or industrial sites;
iv) Intensive agricultural operations;
v) Storage and land application of bio-solids, septage and manure;
vi) Direct industrial and municipal waste discharge to surface waters;
vii) Locations of storm water discharges;
viii) Locations of subsurface infiltration lagoons/ponds;
ix) Septic fields and cemeteries;
x) Fuel storage;
xi) Bulk liquid chemical storage;
xii) Salt piles and snow dumps;
xiii) Airport operations;
xiv) Major highways.

Source Protection Plan

Does the First Nation have influence over the watershed area?
Has consideration been given to development of a source protection plan?

WATER SERVICING PROJECT

ELEMENT: Water Treatment – Feasibility stage

Project Stage: *Feasibility Study*

Aim of Review: *This review focuses on the assessment of the selection of treatment technologies and their suitability for processing the proposed water source.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Source Water Protection Area

For the proposed drinking water source, has the area of source water been delineated by the proponent within the feasibility study submission? Items to consider in making such assessments include:

i) For groundwater, the area that contributes water to the well is known as the capture zone. Typically, capture zones are delineated based on the amount of time water takes to travel to a well-head. For example, typically 50-day, two-year, five-year, 10-year and 25-year capture zones are delineated. Does the feasibility study submission acknowledge such zones?

ii) Although the surface watershed or groundwater capture zone may not be mapped in detail at the feasibility stage, some consideration should be given to delineation, in order to evaluate the suitability of the source based on potential threats and vulnerability to contamination.

iii) Groundwater is influenced directly by surface water.

Technology Suitability

Has the selection of the proposed treatment technology been clearly substantiated?

a) Were adequate water quality parameters sampled and tested?

- Was the sampling conducted during all seasons?

b) Review the assessed treatment technologies for their abilities to meet required treatment criteria.

- Does the claim for the total reduction of contamination across all treatment processes meet the defined treatment criteria?

c) Was consideration given to undertaking an on-site pilot study to test applicable treatment technologies?

d) The need for pilot testing generally arises where site conditions are difficult to simulate at the bench-scale level, where significant operating experience is not available for the proposed treatment technology or where the raw water source exhibits unusual water quality with respect to one or more water quality parameters of concern.

e) Assess the appropriateness of the recommended treatment process (es). Can all raw water contaminants be removed using the proposed treatment process (es)?

Additional considerations:

a) Is there a risk of interruptions to the water supply (i.e. filter cleaning)?

b) Are there locally driven unusual raw water quality issues exhibited by the proposed source that the treatment process must address? Does the proposed treatment process address unusual raw water quality issues?

c) Is fluoridation being considered by the First Nation or Health Canada for application as a post-treatment conditioning process? If so, is appropriate equipment and training planned?

d) Has treatment and disposal of the generated wastewater been addressed?

WATER SERVICING PROJECT

ELEMENT: Water Treatment – Pre-Design Stage

Project Stage: *Pre-Design Stage*

Aim of Review: *Assess the water treatment design. This review focuses on the assessment of the rationale for the design decisions associated with the selected treatment technology and its suitability for the selected source water.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Suitability of Treatment Technology

Has the selection of the adopted treatment technology been substantiated?

a) If pilot testing was conducted, were the methods, time and duration of the pilot project of a satisfactory nature on which to base a design?

b) It is substantiated that the finished water produced by the treatment processes will comply with drinking water quality guidelines and standards?

c) Are there concerns about finished water quality resulting from the application of the proposed chemical dosages used in the recommended treatment process (i.e. coagulation and flocculation)?

Management of Backwash Water

Has collection, treatment and disposal of the generated wastewater (filter backwash water) been addressed?

a) Is the approach acceptable?

b) Is chemical composition of process wastewater a concern?

c) Is the proposed management of backwash water considered acceptable?

WATER SERVICING PROJECT

ELEMENT: Disinfection – Pre-Design Stage

Project Stage: *Pre-Design Stage*

Aim of Review: *Assess the adequacy of the proposed disinfection process to satisfy drinking water disinfection standards and requirements.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Disinfection Design

All communal drinking water systems should provide disinfection to ensure an adequate level of removal or inactivation of pathogenic organisms that may be present in the raw water, to prevent recontamination of drinking water within the distribution system and to maintain drinking water quality throughout the distribution system.

Disinfection must therefore provide initial treatment at the plant or source (primary disinfection) and residual treatment in the distribution system (secondary disinfection). Although some form of chlorination is typical for primary disinfection, ozonation or UV light may also be used. Some form of chlorination, however, will be required for secondary disinfection and maintenance of a residual in the distribution system.

Disinfection By-Products

A key component in the selection and design of an appropriate disinfection system is control of the formation of disinfection by-products. Disinfection by-products (DBPs) are undesirable organic by-products caused primarily by the reaction of chlorine with natural organic matter (NOM) in water.

Laboratory testing can be completed to determine the potential for disinfection by-product formation, including trihalomethanes (THM) such as chloroform, and Haloacetic Acids (HAAs). Measurement of the concentrations of dissolved organic carbon (DOC), turbidity and colour in the source water are initial indicators of disinfection by-product formation potential. The higher the DOC, turbidity or colour levels, the greater the propensity for by-product formation.

Disinfection Protocol

The disinfection system design also involves the location of dosage points. For groundwater systems with storage before the distribution system, the minimum dosage points include locations both before the reservoir and immediately before the distribution system. For systems involving filtration, disinfection dosage points should be provided before treatment, following filtration but before the reservoir, and immediately before the distribution system.

The CT Disinfection Concept

The CT Disinfection Concept combines a disinfectant residual concentration and the effective disinfectant contact time to quantify the capability of a chemical disinfection system to provide effective pathogen inactivation as part of the overall water treatment process.

This contact time should be calculated at worst-case operating conditions – highest anticipated flow rate, lowest water level in reservoir (if applicable), lowest anticipated disinfection concentration and highest anticipated water temperature. If no reservoir is present, then contact time is calculated using the volume of water contained in the distribution pipe on the way to the first user.

The required concentration and contact time is calculated based on CT tables. Typical CT tables can be found in documents such as the *Procedure for Disinfection of Drinking Water in Ontario*, in U.S. Environmental Protection Agency (EPA) guidelines, and in the *Guidelines for Canadian Water Quality – Supporting Documentation (Guidelines for Protozoa)*. These tables indicate the combination of disinfectant residual and contact time required to achieve various levels of pathogenic removal stated in terms of log removal. Typically, groundwater not under the direct influence of surface water, with no other treatment, requires a combination of concentration and contact time to achieve a 2-log (99%) removal or inactivation of pathogenic organisms. Surface water or groundwater under the direct influence of surface water (GUDI) typically requires a 2-log (99%) removal or inactivation of Cryptosporidium oocysts, a 3-log (99.9%) removal or inactivation of Giardia cysts, and a 4-log (99.99%) removal or inactivation of viruses. Credit is provided toward these requirements depending on the treatment provided.

Baffling is installed in reservoirs or other holding vessels used to achieve contact time to enhance tank through-flow distances and to prevent short-circuiting between tank inlet and tank outlet. In effect, the CT time achieved by a given un-baffled storage tank can be increased by up to 10 times through the use of properly designed baffle-wall systems.

Review Checklist

a) Have criteria and rationale for disinfection protocol been presented in the design?

b) Are the criteria upon which the proponent's disinfection protocol is based considered adequate?

c) For primary disinfection, has the CT Concept been used to calculate required disinfection dosage rates?

- Are the criteria on which CT calculations are based clearly presented?
- Is the manner in which the CT Concept has been applied considered appropriate?
- If the CT Concept has not been used, has another method been used? Is this other method considered adequate?
- Are the CT or other calculations based on worst-case operating conditions? Have the worst-case operating conditions been clearly identified and justified?

d) Does the design clearly indicate to the operator the required disinfection residual to be maintained during primary disinfection?

e) Is adequate holding time provided?

- Is baffling proposed?

f) Are the disinfection dosing points that are provided within the design adequate in both quantity and location within the treatment process, based on the source and type of treatment?

- Is the type of disinfection – or in some cases oxidation – chemical appropriate for the application at hand?

g) Does the design incorporate adequate measures to reduce or avoid the potential of disinfection by-products?

h) Is there adequate provision for secondary disinfection and maintenance of a residual in the distribution system?

- Are the proposed disinfectant dosages satisfactory?

WATER SERVICING PROJECT

ELEMENT: Water Monitoring Protocol – Design Stage

Project Stage: *Design Stage*

Aim of Review: *Assess whether proposed monitoring of the quality of both raw and finished water is adequate.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Monitoring Protocols

The monitoring systems and protocols apply primarily to the water treatment facility and distribution pumping systems. Monitoring of the distribution piping is rare and would be limited to requirements associated with disinfection booster stations.

Is the plan for water monitoring systems in the operation of the water treatment facility and distribution systems adequate?

Monitoring systems generally refer to the use of automatic electronically based devices designated to measure various water quality, process system and/or building function parameters.

a) Water quality monitoring of both raw and finished water streams generally include:
   - Turbidity level analyzers
   - Chlorine residual analyzers
   - pH level analyzers
   - Particle counters

b) Process system function monitoring devices generally include:
   - Pressure measurement
   - Flow meters

c) Building function monitoring devices generally include:
   - Air quality monitors, temperature.

Monitoring protocols also include conducting regularly scheduled manual sampling and testing of water quality and system performance parameters by the operator. Monitoring by hand is required in the absence of automatic monitoring equipment and is also often used to augment automatic monitoring data.

Health related reviews will focus primarily on the manner in which water quality monitoring devices are engaged within the scope of a project, and include:

a) Identifying regional, provincial or other guidelines specifying minimum levels of water quality monitoring (e.g. Ontario Reg. 170/03 dictates mandatory turbidity monitoring):
   - Determine whether the regional mandatory monitoring requirements will be adopted for the project at hand.
   - If so, perform the review against these adopted criteria.
   - Does the design clearly present a list of parameters planned for monitoring within the water treatment facility? Are there any monitoring gaps?
   - With respect to the proposed monitoring requirements, what parameters will be monitored, and how frequently will they be monitored after the water treatment plant is running?

b) Is the facility equipped to satisfy the regularly scheduled on-site manual water quality testing that will be carried out?
   - Are portable water quality measurement devices considered?

c) Does the design include information monitoring for water quality parameters appropriate to the water source, raw water quality and type of treatment?
   - As a minimum, provision should be made for raw and treated water turbidity, chlorine residual at both the pre- and post-clearwell locations, and pH monitoring.
   - Continuous on-line monitoring is recommended for turbidity and chlorine residual.
   - Is there provision for automatic recording of data?

d) Is provision made for manual sampling points of both raw water, treated water before the reservoir, and post reservoir before the distribution system?

e) Does the design proposal include remotely situated components for which automatic monitoring could be considered (i.e. chlorine booster stations, wet wells)?

f) Suggested alarm notification conditions might include:

- High/low clearwell water levels (as required)
- High treated water turbidity
- High/low chlorine residual levels
- Adverse pH levels within the function of the treatment process

g) In the case of rural areas where water is transmitted through low pressure water pipes into cisterns, is there provision for sampling points to ensure routine sampling? The water sample should be from the distribution line, not from the cistern.

WATER SERVICING PROJECT

ELEMENT: System Integrity – Design Stage

Project Stage: *Design Stage*

Aim of Review: *Assess the potential for cross-contamination situations.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Cross-Connection Control in Water Treatment Facility

Are all hatches providing access to reservoirs or storage tanks suitably equipped with sealed covers, raised edges and/or perimeter run-off troughs?

Confirm that the specifications of any waterproofing agents scheduled for application to concrete or other surfaces within the treated water storage reservoirs or storage tanks are suitable for potable water environments.

a) Should conform to NSF 60 and NSF 61 as a minimum.

Are the piping penetrations of the operating floor through to the treated water reservoir fitted with suitable watertight seals and/or other water stoppage mechanisms?

Where the water treatment facility is equipped with a washroom:

a) Is the sewer service pipe completely isolated from the treated water reservoir or storage tanks?

b) Is all other drain/waste/vent (DWV) piping (i.e. floor drains, process wastewater drains, etc.) completely isolated from the treated water reservoir or storage tanks?

Where the water treatment facility is equipped with on-site fuel storage capacity (i.e. for heating, standby generators or diesel driven pumps)?

a) Is there proper containment for fuel storage facilities?

b) Is proper secondary containment for fuel storage provided? Are the secondary containment mechanisms adequate?

c) Is the manner in which the fuel tank units are equipped with level monitors and alarms to protect against overfilling considered adequate?

Are the containment, chemical storage and handling facilities designed to protect against treated water contamination in the case of a chemical spill considered adequate?

Cross-Connection Control in Distribution System

Has the cross-connection control been considered in the design?

a) There is to be no connection between the distribution system and any pipes, pumps, hydrants or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system.

Has the design of piping network been done in such a way that dead-ends have been minimized? Is the potential for stagnant water in dead-ends minimized?

a) Are each of the dead-ends equipped with a means to provide adequate flushing operations as well as taking a water sample?

Is the water main positioned at least three metres horizontally from any existing or proposed gravity sanitary sewer, septic tank or subsoil wastewater treatment system?

a) No water pipe is to pass through or come into contact with any part of a sewer manhole.

Are the inverts of water mains, branches and house connections 450 millimetres above the obverts of sewer lines at any cross-over locations?

Are the truck fill stations adequately designed to be serviced?

a) Equipped with suitably sized and suitably specified backflow preventers?

b) Equipped with piping arrangements that prevent contaminants from being transferred from a hauling vessel to others using the station?

c) Equipped so that hoses aren't contaminated by contact with the ground?

Disinfection, Flushing and Cleaning Practices

Does the design exhibit an ability to maintain disinfection residuals throughout the length of the distribution system? If not, should disinfection booster stations be considered?

If equipped with disinfection booster stations, is the design considered adequate?

In the case of rural areas where water is transmitted through low-pressure pipes into cisterns, are flushing points provided?

Appendix E:
Wastewater Servicing Project Review Elements

WASTEWATER SERVICING PROJECT

ELEMENT: Sewage Collection System – Feasibility Stage and Pre-Design Stage

Project Stage: *Feasibility Stage and Pre-Design Stage*

Aim of Review: *Assess the integrity of the sewage collection system design and the adequacy of the measures taken by the proponent to achieve integrity; to assess the proponent's treatment of potential hazards that may contribute to undesirable exposure or cross-contamination of water supply.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Physical Layout and Infrastructure Routing

Sewer mains, septic tanks and subsoil wastewater treatment systems are to be positioned at least three metres horizontally from any existing or proposed water service pipe. Is this stipulation satisfied, and shown to be satisfied, in the project submissions?

a) No water pipe is to pass through or come into contact with any part of a sewer manhole. Is this stipulation satisfied, and shown to be satisfied, in the project submissions?

Vertical separation between sewer and water main piping at pipe crossings is to be at least 450 millimetres. Is this stipulation satisfied, and shown to be satisfied, in the project submissions?

Is the collection system equipped with overflow and/or outfall mechanisms, either emanating directly from manholes or from pumping station wet wells?

a) Are the protocols governing the operation and function of such overflow/outfall mechanisms clearly described? Are the protocols acceptable?

b) Is the anticipated quality of effluent emanating from the project's overflows/outfalls assessed? Is the effluent quality considered acceptable within the system's operation and function?

c) Are the alignments, grades and materials of construction of overflow/outfall discharge routes clearly delineated?

d) In what manner are any overflow/outfall routes protected from inadvertent public access? Are these measures acceptable?

e) Are alarms or other notification mechanisms in place to signal whether overflow/outfall conditions are being experienced by the collection system? Are these mechanisms/systems considered adequate under the operational circumstances?

f) For lagoon systems and sludge disposal beds, does geotechnical information in the feasibility and design submissions show how it will reduce or avoid migration of effluent to groundwater?

WASTEWATER SERVICING PROJECT

ELEMENT: Effluent Discharge – Feasibility Stage and Pre-Design Stage

Project Stage: *Feasibility Study Stage and Pre-Design Stage*

Aim of Review: *Assess the effluent discharge systems and operating protocols.*

Reviewer: *Environmental Health Officer (EHO)*

Review Focus and Issues Identification:

Potential Impact on Other Water Uses

Has the receiving body and proposed location of wastewater discharge been identified?

a) Has the water quality of the receiving body been documented?

b) Does the documentation indicate that the treated effluent discharges into the receiving body upstream from, or in the vicinity of, a known water supply source or intake structure? Is enough information presented to assess these conditions?

- Attention should be directed to an intake's location relative to the effluent outfall structure?

c) Is there recreational activity (i.e. beaches, swimming, diving, boating, etc.) in the location of wastewater effluent discharge?

- Attention should be directed to the location of such water uses relative to the effluent outfall structure?
- Have these concerns been addressed in the submission by the proponent?
- Evaluate the results of treated wastewater discharge in close proximity to recreational facilities and drinking water intakes.
- If the proximity of the effluent discharge poses potential public health risk, evaluate the effluent quality before it is discharged. The sample results should be assessed to determine if they comply with applicable standards.

Does any part of the wastewater system fall within a water source protection plan area?

a) Is the water source protection plan area identified and referenced within the proponent's submission packages?

b) If so, are precautions to protect the water source identified?

WASTEWATER SERVICING PROJECT

ELEMENT: Physical Integrity and Access Restriction – Design Stage

Project Stage: *Design Stage*

Aim of Review: *Assess the design with respect to potential for cross-contamination.*

Reviewer: *Public Health Engineer (PHE)*

Review Focus and Issues Identification:

Cross-Contamination

Is the wastewater treatment facility equipped with domestic water service?

a) Is the manner in which water service piping is completely isolated from any effluent streams, tankage or any other drain/waste/vent piping (i.e. floor drains) systems considered adequate?

APPENDIX 1
Glossary of Terms

Glossary of Terms

algae – Simple rootless plants that grow in sunlit waters in proportion to the amount of nutrients available. They can affect water quality adversely by lowering the dissolved oxygen in the water. Many species can produce toxins that may affect health of animals and humans. They are food for fish and small aquatic animals.

alkali – Any strongly basic substance of hydroxide and carbonate, such as soda, potash, etc., that is soluble in water and increases the pH of a solution.

alkalinity – A measure of water's acid-neutralizing capacity, primarily a function of the amount of carbonate, bicarbonate, and hydroxide found in the water.

ambient – Surrounding.

Aesthetic Objectives (AO) – Guidelines for parameters or characteristics such as taste, odour, or colour of water or that may affect the water treatment process. For certain parameters, both AOs and health-related guidelines (maximum acceptable concentrations) have been established. When only an AO is specified for a certain parameter, it means that either no potential health hazard exists, health effects would be of concern only at concentrations significantly higher than the AO, or there is insufficient data to establish a MAC.

bacteria – Simple, unicellular organisms with an average size of 1/1,000 mm diameter.

Boil Water Advisory/Order – A public notice issued by a provincial or local health authority through broadcast media that informs users of a public water system that their drinking water is, or potentially is unsafe microbiologically, and is considered unsafe for drinking or for domestic purposes and should be boiled before use. To kill water pathogens, water should be brought to a rolling boil for one (1) minute and then allowed to cool (and be protected from further contamination) before consumption.

bottled water – Water sold to consumers in sealed containers. It can be represented as "spring" or "mineral" water. It might also be water from various sources that may have been treated to make it fit for human consumption and put in sealed containers for sale. It can be carbonated (mineral or sparkling water), natural (bottled without any chemical treatment) or effervescent (seltzer)

by-product – New products or substances formed when a chemical reaction occurs.

chlorine – An oxidizing agent commonly used as a disinfectant. When added to water, it reacts to form two disinfectants know as 'free residual chlorine' and 'total residual chlorine'.

cistern – A small covered water storage tank typically used for catching and storing rainwater. It is also used for storing treated water.

coliform bacteria – A group of bacteria commonly found in the intestinal tracts of warm-blooded animals, which is used as an indicator of unsanitary water quality. Exposure to some of these organisms in drinking water may cause disease. There are three different groups of coliform bacteria: total coliform, faecal coliform and *E.coli*, each having a different risk level.

coliform bacteria, total – A collection of relatively harmless microorganisms that live in large numbers in the intestines of humans and animals, and that aid in the digestion of food. A specific subgroup of this collection is the faecal coliform bacteria (also known as thermotolerant coliforms), the most common member being Escherichia coli (*E. coli*). These organisms are distinguished from the total coliform group by their ability to multiply at elevated temperatures and by their association only with the faecal material of warm-blooded animals.

community wells – A well that provides drinking water on reserve to a public facility, such as a health facility or a school, which is operated by the First Nations community or Health Canada.

conventional treatment – The use of water treatment processes such as coagulation, flocculation, sedimentation, filtration, and disinfection, also known as complete treatment.

***Cryptosporidium* –** A widespread intestinal protozoan parasite commonly found in lakes and rivers, which is highly resistant to disinfection. May cause gastrointestinal illness.

disinfection by-product – A chemical compound formed by the reaction of a water disinfectant (e.g chlorine) with a precursor (e.g. natural organic matter) found in a water supply.

distribution system – A distribution system is the total collection of pipes and materials that creates the physical path drinking water takes from the moment it leaves a water treatment plant until it reaches the consumer.

drinking water – Water that is safe for human consumption, also known as potable (drinkable) water.

domestic use – The water used for household purposes such as drinking, cooking, brushing teeth, washing fruit and vegetables, washing dishes, preparing baby food and formula, feeding pets, washing/bathing, making ice cubes, and other activities.

exposure – Contact with a chemical, physical, or microbial agent (e.g., through inhalation, ingestion, or dermal contact). It is important to be precise when discussing exposure to various agents because different routes of exposure can have greatly different health impacts.

finished water – Water that has been treated, is safe for drinking and is ready to be delivered to consumers.

***Giardia* –** Protozoan parasites found in a variety of vertebrates including mammals, birds, and reptiles, and frequently found in rivers and lakes, which, if not treated properly, may cause gastrointestinal illness (Giardiasis).

groundwater – The supply of fresh water found beneath the earth's surface (usually in aquifers) that is often used for supplying wells and springs.

hazardous waste – A by-product or left-over product from processes or a finished product that is harmful to human health or the environment and requires special disposal techniques.

health risk – The likelihood (or probability) that a given exposure or series of exposures to chemical, physical, or microbial agents may have damaged or will damage the health of individuals.

inorganic matter – Matter of mineral origin such as sand, salt, iron, calcium salts, or other mineral materials.

maximum acceptable concentration (MAC) – A concentration established by the Federal-Provincial-Territorial Committee on Drinking Water for specific water contaminants that are known or suspected to cause adverse health effects at levels that may be found in Canadian drinking water supplies. For most contaminants, these concentrations are based on health, such that lifelong exposure to drinking water containing the contaminant at the MAC would not increase risk to health. For microbiological contaminants and other contaminants with acute effects, MACs are established based on much shorter exposure periods. MACs are established using a weight of evidence approach, and incorporate risk management considerations such as treatment achievability.

microorganism – an organism that can only be seen with the aid of a microscope, also called a microbe.

multi-barrier approach – An integrated system of procedures, processes, and tools that collectively prevent or reduce the contamination of drinking water from source to tap in order to reduce risks to public health. The goal of this approach is to reduce the risk of contamination of drinking water, and to increase the feasibility and effectiveness of remedial control or preventative options.

Nephelometric Turbidity Unit (NTU) – A unit of measure for the amount of turbidity (or cloudiness) in water.

operational guidance value – A maximum concentration in drinking water established for a chemical used in drinking water treatment, but for which there is currently no consistent, convincing evidence of health effects or issues related to its palatability. This value is established in recognition of advancing research and in an exercise of the precautionary principle.

operating guideline – A procedure by which to determine a course of action to perform a function.

organic – Referring to or derived from living organisms (plants or animals); in chemistry, any compound containing carbon.

organism – Any individual animal or plant having diverse organs [and parts that function together as a whole to maintain life and activities.

pathogen – A disease-inducing organism or abiotic (non-living) agent.

pathogenic microorganisms – Microorganisms that can cause disease in other organisms including humans, animals, and plants.

pH – An expression of both acidity and alkalinity on a scale of 0 to 14, with 7 representing neutrality; numbers less than 7 indicate increasing acidity and numbers greater than 7 indicate increasing alkalinity.

public health – The science and art of preventing disease, prolonging life and promoting health through the organized efforts of society.

purveyor – The organization or person(s) who own or run the drinking water system (including treatment plant(s) and distribution system). Examples include public or private water utilities

protozoa – Single-celled organisms, more complex physiology than viruses and bacteria; average size of 1/100 mm diameter.

radionuclides – A material with an unstable atomic nucleus that spontaneously decays or disintegrates, producing radiation. Typical naturally-occurring radionuclides include radioactive isotopes of uranium, thorium, radium, lead and polonium.

raw water – Water in its natural state, prior to any treatment for drinking, also known as source water.

risk – The overall process of using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of their consequences.

risk assessment – The process of estimating the potential impact of chemical, physical, microbiological or psychosocial hazard on a specified human population or ecological system under a specific set of conditions and for a certain timeframe.

risk communication – A process involving the exchange of information among individuals, groups, and institutions of information and expert opinion about the nature, severity, and acceptability of risks and the decisions taken to prevent, eliminate, or reduce them.

risk management – The systemic evaluation of the water supply system, the identification of hazards and hazardous events, the assessment of risks, and the development and implementation of strategies to prevent or manage risks.

septic tank – A tank (usually underground) into which the household wastewater flows and is held to settle and allow for some degree of decomposition by bacteria. They are commonly used in rural areas where no municipal wastewater system is available.

sewage – The used water and water-carried solids from a community (including used water from industrial processes) that flow to a treatment plant; also known as wastewater.

sewage system – Pipelines or conduits, pumping stations, force mains, and all other structures, devices, and facilities used for collecting or conducting wastewater to a point for treatment or disposal; also known as a wastewater system.

Split samples – Quality control samples that are used to assess analytical variability and comparability.

source water – Water in its natural state (source), prior to any treatment for drinking; also known as raw water.

surface water – All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.

toxicity – The quality or degree of being poisonous or harmful to plant, animal or human life.

turbidity – Cloudiness caused by the presence of suspended matter in water

wastewater – The used water and water-carried solids from a community (including used water from industrial processes) that flow to a treatment plant.

wastewater treatment plant – A facility containing a series of tanks, screens, filters, and other processes by which pollutants are removed from wastewater water.

water – An odourless, tasteless, colourless compound formed by a combination of hydrogen and oxygen (H_2O) which can be in liquid, solid or gas form. Water, in a more or less impure state, constitutes rain, oceans, lakes, rivers and other such surface water bodies as well as groundwater. Water is a major constituent of all living matter.

water contamination – Impairment of water quality to a degree that reduces the usability of the water for ordinary purposes or creates a hazard to public health through poisoning or the spread of diseases.

water pollution – The addition into water of harmful or objectionable materials and substances in large enough quantities to adversely affect the water's usefulness.

water quality – A term used to describe the chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

water treatment – The act of removing contaminants from source water by the addition of chemicals, filtration, and other processes thereby making the water safe for human consumption.

water treatment device – A gravity type device i.e."pitcher" or "pour through" style filter, or a device attached to the service connection of an individual dwelling at the point of entry or point of use, e.g. under a sink on a faucet, to remove one or more contaminants.

well – A pit, hole, or shaft sunk into the earth to tap an underground source of water (groundwater).

wellhead – The structure built over a well to maintain water protection; the land area surrounding a drinking water well or well field.